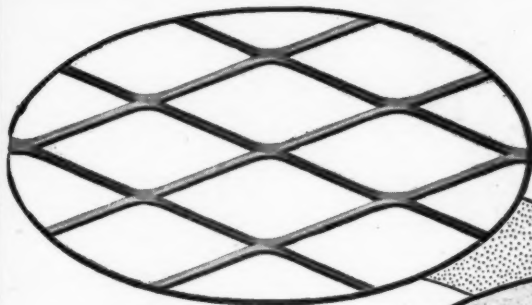


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No. 11

September 13, 1917

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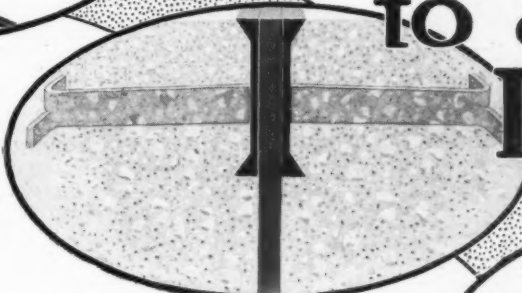
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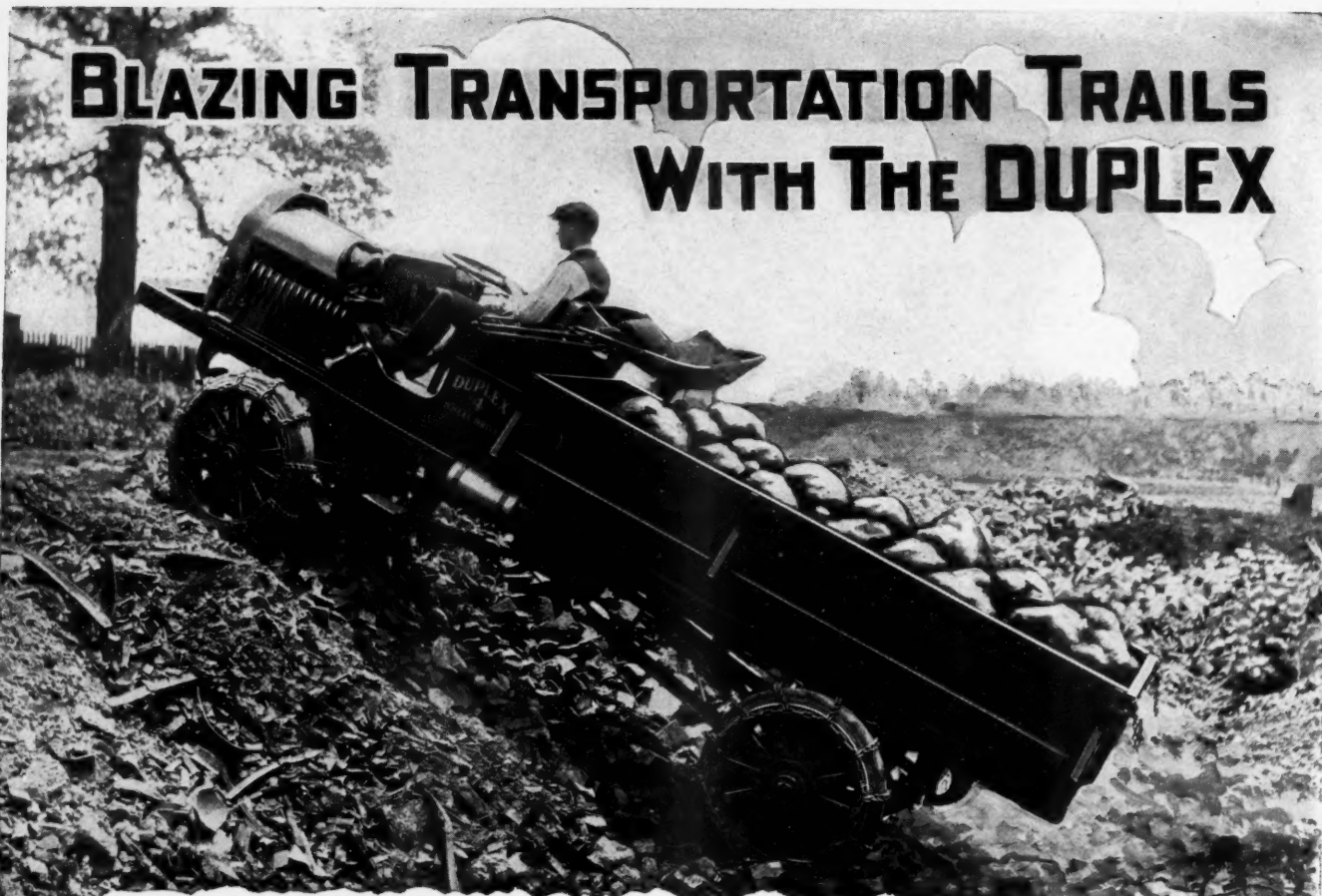
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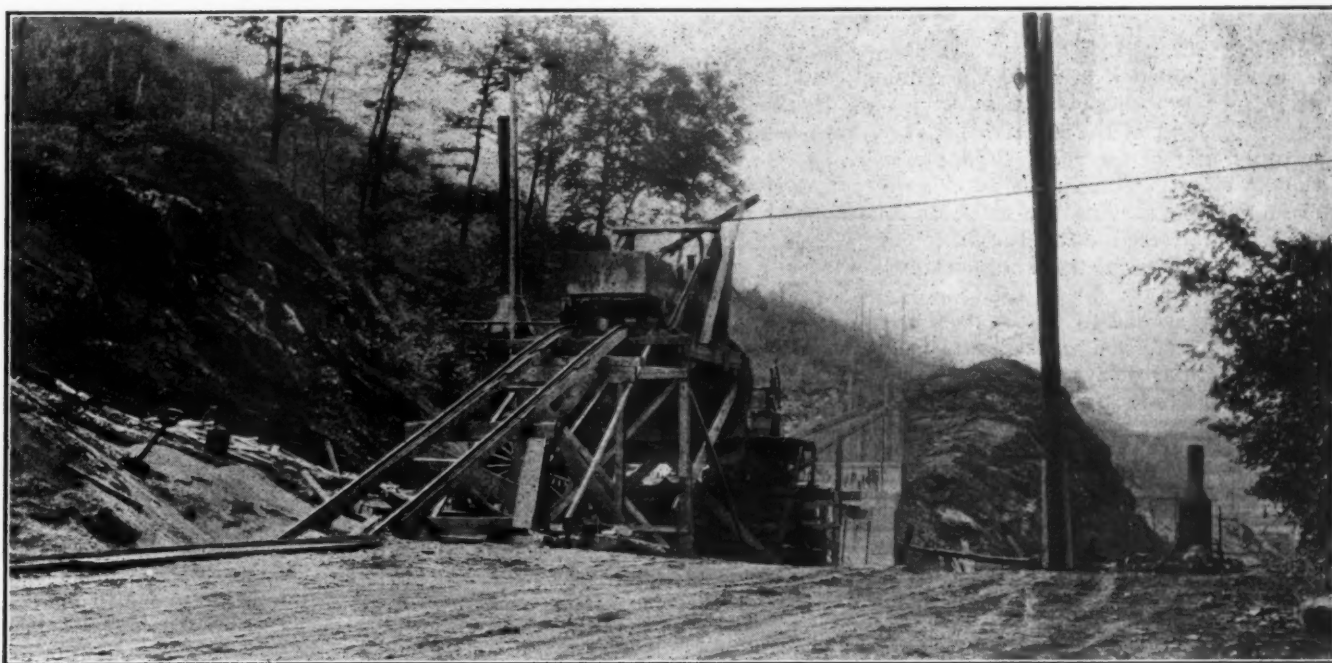
Volume XLIII

NEW YORK, SEPTEMBER 13, 1917

No. 11

## WIDENING AND STRAIGHTENING A CONNECTICUT HIGHWAY

Replacing One Grade and Two Overhead Crossings by Concrete Arch Bridge—Making a Fill While Maintaining a Way for Traffic—Steam Shovel Used in Rock Cut—Constructing Concrete Bridge.



MIXER AND MIXER CHARGING DEVICE AT BRIDGE CONCRETING PLANT, BOLTON NOTCH.

The Connecticut Highway Commission is spending nearly \$45,000 on the improvement of slightly more than a mile of highway in the town of Bolton, about 15 miles from Hartford and on the main route east from that city. The work consists of new location for practically the entire distance, very heavy cuts, mostly in rock, and the substitution of one overhead crossing for one grade crossing and two bridge crossings over the railroad. All these old crossings were dangerous—the grade crossing because of its location where the railroad curves sharply out of a deep cut and the bridge crossings because of the narrowness of the bridges—about 12 feet—their high sides which cut off all view of approaching vehicles, and the right angle turns at the ends. At one end of each bridge was a drop of 20 feet to the railroad track, with only a frail guard fence as a protection in case the bridge was missed.

The present arrangement carries the road parallel to the railway for a distance of about 300 feet, substituting in this distance a 94-foot concrete bridge for the old grade crossing and eliminating the overhead crossings. This also eliminated several short, steep grades, one with a pitch of 16 per cent, and a steep approach at one of the bridges. On the relocated section, which comprises practically the entire section, the heaviest grade is 9 per cent and the curvature has been reduced greatly. About 20,-

000 cubic yards of rock excavation was necessary, most of which was used in fills.

The rock found at this point was chiefly a mixture of mica schist, granite and gneiss and the formations are folded and twisted to such an extent that effective blasting and handling of the rock was difficult, but excavation without blasting was impossible. In some places ledge rock was found only a foot or two above grade and this necessitated costly methods of removal. In this kind of work the usual method was drilling by means of small air-operated hand drills and blasting with light charges, afterward taking out the broken rock by hand. All air was furnished by an Ingersoll-Rand air compressor operated by a small steam engine. Air was carried through more than 2,000 feet of pipe in some cases.

In the deeper cuts (one was over 16 feet deep) the rock was blasted and then taken out by a Thew type A-1 steam shovel. This was equipped with a  $\frac{3}{4}$ -yard dipper and proved very effective in handling the blasted material. The rate of removal was limited by the amount that could be hauled away, owing to the cramped space available for waste removal.

The rock obtained from the westerly cut, which was the deepest one, was used for making a large fill just below. Lack of suitable detours made it necessary to maintain an open way for traffic at all times. Owing to



CENTERING FOR 94-FOOT SPAN CONCRETE BRIDGE AT BOLTON NOTCH.

the fact that this road was the main route from Hartford east, the traffic was usually rather heavy and more or less impeded the progress of the work. On this account the fill had to be made in two parts. A Koppel track was laid along one-half of the road, mounted on a wooden trestle, and the spoil from the cut dumped from this. As one-half of the road was filled, a rough dry wall was laid up by hand in the middle, this serving to keep clear the other half of the road. While care had to be taken in dumping, this allowed the fill to be placed to its entire height without moving the track or removing or reconstructing the trestle. After the fill for the first half of the road had been completed, another trestle was built on the other half, and the fill on this completed; traffic, meanwhile, being shifted to that part of the fill already completed. This method worked well and to a large extent obviated serious delays to the heavy motor traffic.

Owing to the lack of space, the heavy grade on which

the fill was being made, and the difficulty of handling a large number of construction cars, only four such cars could be used on this fill at one time—two loading while the other two were being dumped. The steam shovel loaded directly into the cars, usually filling them with about two dippers. Only a single track could be used on the narrow fill, and the nine per cent grade made it inexpedient to attempt to handle more than two loaded cars at a time. The loaded cars were let down the hill and the empties drawn up by means of a  $\frac{3}{4}$ -inch cable attached to a Mundy hoisting engine placed a short distance from the top of the hill. The Koppel equipment on the job consisted of about 2,000 feet of standard 24-inch, 20-pound track and four standard side-dump cars of  $1\frac{1}{2}$  yards capacity. The average work for one hour was 13  $\frac{1}{2}$ -yard cars. In 32 days on heavy cutting, where the limited space reduced the amount of material that could be handled, 3,777 of these  $1\frac{1}{2}$ -yard cars were taken out, the total working time being 287 hours.

Next to this heavy fill and cut was several hundred feet of shallow fill which was made with rock and earth se-



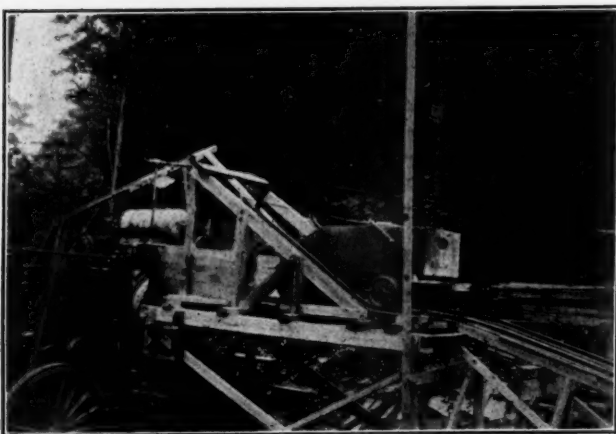
GRADE CROSSING ELIMINATION, STORE AT RIGHT REMOVED AND ROAD FOLLOWS RIGHT SIDE OF RAILROAD.



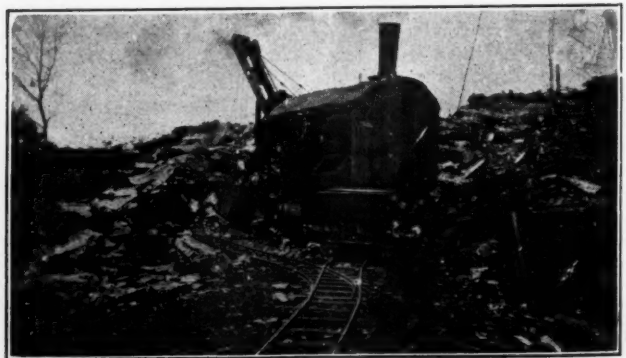
THE RAILROAD CUT BRIDGED TO ELIMINATE DANGEROUS CROSSINGS.

cured from a couple of rather shallow fills at the other end of the job. This haul of about three-quarters of a mile was made entirely by teams, the steam shovel loading from a shallow cut, which varied in depth from 12 to 20 inches, directly into the wagons. The average load was a yard and a half, and the five teams used could not keep the shovel busy more than half the time. The average time required for the teams to make the round trip of a mile and a half was about 35 minutes, while the shovel required but two minutes to load each wagon; even less time was required in dumping. The shovel employed its spare time in gathering the earth in piles so as not to keep the wagons waiting, in moving forward, etc. Some time was lost due to traffic delays.

Some difficulty was encountered in the construction of the concrete arch bridge forms, owing to the skew of 35 degrees. This bridge has a span of 94 feet and required about 350 cubic yards of concrete and 26,000 pounds of



CHARGING CAR AND DUMP, BRIDGE CONCRETING PLANT.



STEAM SHOVEL IN ROCK CUT AT BOLTON NOTCH.



reinforcement, exclusive of the abutments. It was poured in three sections, each section requiring 22 hours of continuous concreting. A Ransome concrete mixer was used. This was charged from overhead by a small car filled with stone and sand in their proper proportions, pulled by cable up an inclined track and dumped by means of two extra rear wheels having a wider gauge and operating on a track having a steeper incline. Steady pulling on the cable raised the car from the sand and stone piles to a position over the mixer and dumped it, thus eliminating several barrow men and shovelers.

The concrete when thoroughly mixed was dumped into small concrete cars which operated on a 24-inch gauge track laid on timbers supported by and forming part of the false-work for the forms. The cars were pushed by hand to the desired point and dumped in place. To furnish illumination for night work, Carbic lights were used. A section once started, work was continued until all the concrete had been poured.



94-FT. CONCRETE ARCH UNDER CONSTRUCTION.

\$45,000, of which approximately \$16,500 will be borne by the New Haven Railroad as its share toward the elimination of the grade crossing.

#### ROAD BUILDING IN RECORD TIME.

A record-breaking piece of road building was completed last week in connection with the army cantonment near Louisville, Ky. This is one of the few military establishments that have built permanent roads. In 63 working days the contractor completed 63,360 square yards of Trinidad asphaltic concrete highway, laid on a concrete base, or about 6 miles of road 18 feet wide. A mile of the road was over a four-foot fill, and immediately upon its completion a traffic count showed that 4,000 vehicles passed over it within the first hour. Most of these vehicles were motor trucks and wagons carrying loads of from one to five tons. The record made by the Bickel Asphalt Paving Company, the contractors, is all the more remarkable in view of the fact that it was necessary to haul and crush all the stone used on the work.



DANGEROUS CONDITIONS AT OVERHEAD CROSSING.

The work includes about 20,000 cubic yards of earth and rock excavation, classified as rock because of the boulders and ledge rock at the bottom, at \$2 per cubic yard; 3,000 cubic yards of dirt fill at 75 cents per yard; 350 cubic yards of first-class concrete at \$20 per yard; 300 cubic yards of second-class concrete at \$18 per yard and 26,300 pounds of reinforcing steel at 6 cents per pound.

It was originally planned that only a small amount of second-class concrete would be used for the bridge abutments, but the discovery of a large section of poor rock required the use of the amount named. On account of the many fills, the first plans called for an eight-inch gravel pavement, no more permanent pavement to be laid until final settlement of the fills had taken place. About 2,200 cubic yards of gravel was required for this topping, the contract price of which was \$1 a yard. Later it was decided to add a 3-inch trap rock surface treated with tar. The price for this, which will require about 11,000 square yards, will be agreed upon later.

The contractors for the work are L. C. Fay & Co. of Springfield, Mass. Robert W. Stevens of Hartford is the division engineer in direct charge of the work. J. L. Fitzgerald is inspector. The total cost was approximately



THEW SHOVEL ON LIGHT GRADING WORK.



REINFORCEMENT IN PLACE, MIXING PLANT AND TRACK

## MAINTENANCE OF CONCRETE PAVEMENTS

The First of a Series of Articles Explaining Practical Methods of Maintaining the Various Kinds of Pavements in General Use on Highways and City Streets.

By CHARLES CARROLL BROWN.\*

The defects in concrete pavements are of several classes, due to poor materials, to poor workmanship, and to deformations in the completed concrete slab.

In the first class belong the holes caused by foreign materials in the aggregates, such as bits of wood, clay, or other materials whose forms are perishable, by scales or soft places due to dirt or collection of fine dust or sand or micaceous or other non-adhesive material. These defects are due to poor specifications for materials or to inefficient inspection of them or of the mixing of materials, and are ordinarily inexcusable. When they occur generally throughout the work and maintenance is neglected, they result in rapid disintegration of the pavement and its early failure. If such pavements are watched continuously and repairs are made promptly upon the first appearance of the defects, their life will be greatly prolonged, but at a considerable annual expense for maintenance, thus disappointing those who have been promised a pavement which will not require immediate expenditure for maintenance. Occasional defects of this sort can be taken care of by the methods of repair described below, at small cost, lengthening the life of the pavement if repairs are made promptly.

If the defects arising from these causes are allowed to grow so that they cover considerable areas or so that the edges of the holes are badly battered and shattered by the blows of traffic, no thoroughly satisfactory methods of repairing them have yet been found and it is a question of but a short time until the pavement must be torn out and replaced.

If the defective area is six or more inches in each horizontal dimension and extends nearly or quite through the thickness of the slab, it may be replaced with fair success by cutting away the concrete and refilling the hole with new concrete. There are three essentials to thorough bonding of the new concrete with the old: Vertical sides to the hole cut back to perfect concrete in the slab, thorough moistening of the old concrete without softening the sub-grade into mud, and thorough bonding of the new concrete to the old by tamping it in solidly and to uniform surface with the slab, with protection from traffic or displacement for a week or ten days until thoroughly set and bonded.

Gravel may be thoroughly tamped into the sub-grade sufficiently so that the hole in the concrete can be filled with water and allowed to stand for some hours if possible, when the gravel should be thoroughly tamped in and refilled and the concrete can be tamped into place until there is no danger of further settlement. The surface should be smoothed off to the exact level of the surrounding concrete, using a wooden float. Any thin projections from the new concrete will be quite certain to break off and if any develop it is proof that the preparation of the hole was not properly made. Perfect bonding of the old and new concrete will not be obtained unless the new concrete is of the same materials and practically the same mixture as the old. The surface must be covered with sand or earth kept moist and protected from traffic for at least a week. The many defective patches made in the general manner described are evidence of the difficulty of making them correctly or of general carelessness in making them.

Occasionally a patch can be made in this way, even if the disintegration does not extend clear through the slab, but apparently there is better success with these thinner patches if they are made with bituminous concrete. As this method is used by the Ohio State Highway Department, the hole is first thoroughly cleaned of all defective concrete and dust by thoroughly sweeping, first with steel or rattan brooms and then with a house broom, followed, if convenient, with an air blast from a tire pump or other device. Vertical sides to the hole are not essential. The surface must then be painted with hot tar, such as Tarvia X, which is specially prepared for such purposes as this. The hole is then filled with bituminous concrete made with the same tar and broken stone or stone chips in proportions of about 1 part of tar to 11 parts of stone. The stone should not be larger than one-half the depth of the hole to be filled, and the hot mixture must be turned with shovels not less than six times on a platform until all particles of stone are thoroughly covered. The surface of the patch should be covered with stone screenings or coarse, dry sand (preferably the former), and it should be thoroughly compacted so that there will be no voids in the material of the patch.

If the defective areas are not deep, screenings  $\frac{1}{4}$ -in. to  $\frac{3}{4}$ -in. in size, or  $\frac{3}{16}$ -in. to  $\frac{1}{2}$ -in., according to the general run of depths, may be used. The surfaces of the areas to be patched should be thoroughly swept as above described with wire or rattan, followed by soft brooms, and by air blast if possible, and all dust and laitance of new concrete, if any, removed. The hot tar is then applied to the dry, clean concrete and rubbed in well with a squeegee or stiff broom to insure good bond with the concrete. The stone, slag, or gravel screenings are then applied. If the hot tar must be applied at the rate of more than  $\frac{1}{2}$ -gal. a sq. yd., the patch should be applied in two coats, the excess of screenings in the first coat being brushed off before the second coat is applied. If the surface of the concrete is generally in bad condition, the same process can be used to cover the whole surface. If the precautions above stated are all adopted and the grit or screenings is spread uniformly and just sufficient in amount to incorporate with the tar, a satisfactory result will be obtained. Any prominent depressions greater than usual and any open cracks or joints should be filled by the methods given above or below before beginning the general treatment as above. The idea is to make the finished treated surface uniform and fully covered with screenings or grit so that it will be smooth for traffic. The deeper holes will be somewhat soft, probably, and piles of screenings should be at hand along the road for immediate application when warm weather softens them and brings the tar to the surface. Appearance of the tar on the surface not only produces a nuisance and damage to vehicles, but causes still greater damage to the road, and the tar must be kept covered. Ultimately, however, a concrete road requiring such treatment as that described must be replaced by an entire new surface.

Holes of very small areas can be filled with tar or with a mixture of tar and sand, and a bit of grit spread on the surface, and the patch will keep its place very well.

Tar, liquid enough to use cold, can be used in the

\*Western Editorial Representative of MUNICIPAL JOURNAL.



same manner described above, except heating, with satisfaction for the smaller holes and joints, but does not give as good results for large holes and general treatment as the heavier tars requiring heat before mixing. The cold tar becomes stiff in the mixture after a few days of exposure and gives no trouble until hot weather comes.

#### CRACKS AND JOINTS.

Cracks and widened joints usually occur from deformations of the concrete slabs. Contraction caused by cold opens joints and, especially if they are not protected with steel protection plates, the edges of the concrete may be broken and holes will develop. If the steel protection is too low or too high the hammering of traffic may have a similar effect.

Cracks may be longitudinal or transverse. The latter are not frequent where transverse expansion (or rather contraction) joints are properly located, but may occur from local settlement of sub-grade or other reason for the irregular support of slab, thus giving the weight of traffic an opportunity to break the slab which is thus required to act as a beam. Longitudinal cracks occur from like beam action of the concrete. Sometimes this is because the edges of the slabs are raised by the expansion of the clay sub-soil from the absorption of water along the edges of the slabs, or from the freezing of water in the sub-soil under the edges, or simply from the tendency of frost in the adjoining berm of the road to lift the concrete slab with which it is in contact. Sometimes it is because the center of the slab is lifted by some absorption of water by a badly drained sub-soil, or by the softening of the sub-soil under the edges of the slabs by water or thawing out of frozen earth, thus permitting settlement of the edges more than of the center. The sub-soil may even be washed out enough to permit such settlement. More often longitudinal cracks within the middle third of the pavement width are due to the arch of the crown. The confinement of the sides by curbs or substantial berms or even the friction of the concrete on the soil on which it rests or in which it is more or less embedded, prevents free movement outward from the center and the stress produced by the sun causes a rise of the crown and a consequent crack. The researches of the U. S. Office of Public Roads have shown that the movements necessary to produce the cracks are easily caused by the motions to which they are here attributed.

Laying the bottom of the concrete on a plane surface, giving the necessary crown to the street by thickening the concrete at the center, prevents many cracks by reducing the arch action and strengthening the concrete in the center, where the strength is most needed. Mesh reinforcement also is used to prevent the cracks from contraction and from concentration of stress on a particular line or area. If the cross section of steel is sufficient, it will be successful in the latter object. It is yet doubtful whether the distribution of the stress due to contraction over the whole area of the slab does not tend to disintegrate the concrete where the wires are embedded so that when it begins to show it spreads rapidly and requires thorough reconstruction shortly thereafter.

The cracks and spalled joints can be repaired readily with hot tar. To make a filling which will be closely adherent and therefore permanent, the joint or crack must be thoroughly cleaned, removing all dirt or other loose or foreign matter by means of an iron hook, stiff wire or rattan brooms and carefully removing the remaining dust with house brooms or compressed air, if it is available. The tar should be heated to 200 or 250

deg. F. It should not be heated too hot nor kept hot too long before using. The tar should be poured into the crack through a narrow spout so as not to spill over the surface of the slab more than enough to cover the whole of the spalled edge of crack or joint. Dry sand or coarse stone screenings must be spread immediately, enough to take up any tar which works to the surface. Before leaving a joint, it must be examined to be sure it remains full to the top, and if the tar has settled or run down or out, the joint must be filled again.

A mixture of equal parts of fine, dry sand and hot tar makes an excellent filler for block pavements and should be equally good for filling cracks and joints in concrete pavement repairing. The tar must be handled quickly, and in cool weather it may be necessary to heat the sand also.

Joint, crack, sand, and screenings must all be dry for the best results. The exact amount of sand depends on its fineness and gradation of sizes, but is never greater than half of the volume of the mixture.

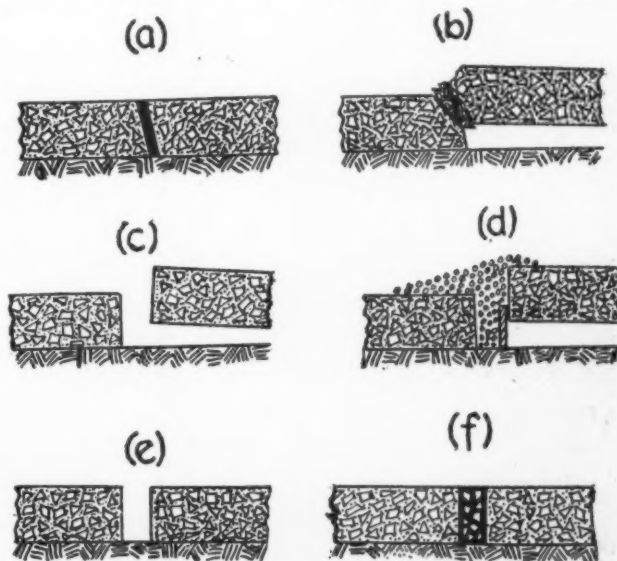
Large cracks and joints are not readily repaired. Concrete will not be permanent in the small volume required, and the tar filling may be too soft to keep its place and its consistency because the volume is too great. The following plan is recommended by the Ohio State Highway Department:

The edges of the crack or joint are first painted with tar, hot or cold, down far enough and out over the edges enough to cover all spalled and broken edges and top surfaces. The space is then filled with a bituminous concrete made of one part of a tar that is liquid at ordinary temperatures and 11 parts of stone chips of  $\frac{1}{4}$ -inch to  $\frac{3}{4}$ -inch size, thoroughly mixed, and then kept for a few days or a week, when it will be stiff enough to bind properly when tamped into a crack. The mixture should be tamped in thoroughly to the level of the adjacent surfaces and then covered with about  $\frac{1}{4}$  inch of coarse grit to take up any tar working to the surface.

The Ohio department proposes the following method of bringing heaved slabs down to grade. The accompanying drawing shows the process in detail:

(a) represents a joint improperly constructed with inclined surfaces, which is one cause for heaved slabs.

(b) represents the same joint when expansion has caused the one slab to move on the other, the motion



ILLUSTRATING LOWERING RAISED PAVEMENT SLABS.

and traffic spalling off the edges of the slabs and lifting one slab above the other. The slab will probably settle back to place if the edges are cut away so that the support is taken out from under the heaved slab.

(c) represents the slabs with edges cut off for this purpose.

(d) shows these edges protected from traffic during the process of settling by a filling of gravel, kept from running under the heaved slab by a board of proper width.

(e) represents the slab settled back to place.



HAULING STONE BY TEAM.

(f) represents the enlarged joint filled with bituminous concrete as described above. If the enlarged joint is 6 inches wide or more, it may be possible to fill it with cement concrete like that used in the original pavement, without an expansion joint.

Sunken slabs can be raised by use of jacks and clayey gravel tamped under to give full bearing.

In both the above cases there is more or less danger of breaking the slabs if heavy loads run over them while they are not in full bearing.

The following are suggested by the Ohio State Highway Department as necessary implements for this work: 100 gal. tar heating kettle for heating the tar, thin iron hook for cleaning the joints, 4 short-handled square point shovels, pick, 2 wheelbarrows, 3 gal. tar pouring can with conical or vertical spout, 3 gal. tar pouring can with rose (same can as above with different spout), 2 wire push brooms, house broom, concrete tamper (6 in. or 7 in.) either square or round, 2 galvanized iron pails (3 or 4 gal.), tamping iron not more than 1/2 in. wide.

On small jobs the tar kettle can be hauled by hand or by 1-horse wagon carrying men and tools, and the sand wheeled from piles on the roadside.

On large enough work a wagon load of sand will carry

the men also and the coal and the bituminous concrete mixed ready for use, and will haul the tar kettle behind.

The Connecticut highway department uses similar methods and reports a maintenance cost of the concrete surface of \$38.63 a mile a year, or 0.4 cent a square yard. Shoulder and drainage work cost \$28.00 additional per mile or 0.3 cent a square yard a year. The cost of all road maintenance (much of the Connecticut system being waterbound macadam) averages \$585.18 a mile or 6.25 cents a square yard a year.

In Ohio the cost of maintenance of concrete roads in 1915 for concrete surface alone was \$29 a mile per year and in 1916 it was \$50.

## RESURFACING AN OLD ROAD WITH CONCRETE

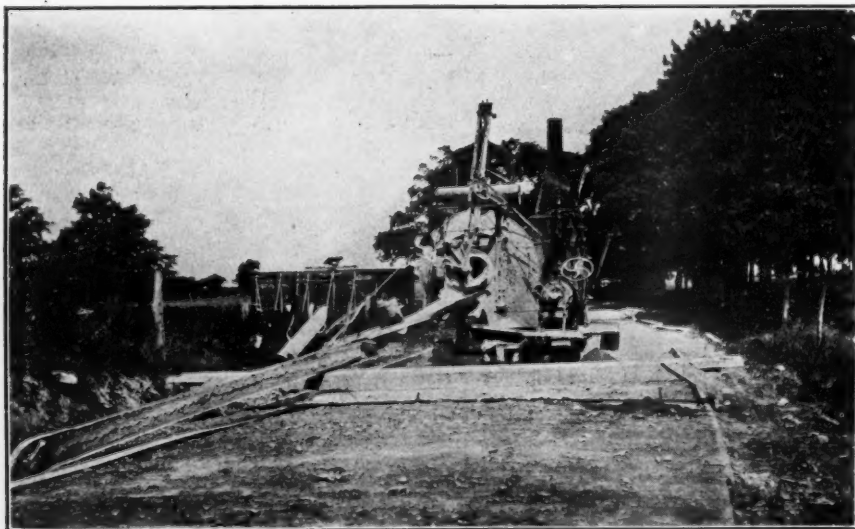
### Machinery and Methods Used in the Reconstruction of an Old Road—Motor Trucks for Hauling Aggregates

The construction of about 7,300 feet of new concrete surface on old bituminous macadam roadway in Albany County, N. Y., which is now under way, is a rather typical job of its kind, and the methods now being employed successfully by the contractors may be of interest to those engaged in work of a similar type. The piece of road under construction is about 10 miles from Albany and three miles from the nearest railroad station, Cohoes, so that hauling sand, stone and cement over hills presented somewhat of a problem, although this was lightened by the fact that the prevailing good roads counterbalanced the rather heavy grades from the station.

The section under construction is 2.26 miles in length and the pavement is being laid 16 feet wide with one-course concrete, mixed 1:1 1/2:3, four and three-quarter inches thick at the edges and six and three-quarter inches at the center. The bottom of the concrete section is flat and the top has a circular section. Expansion joints are placed every sixty feet. These are composed of two-ply tar roofing paper, except that every 300 feet this joint is omitted and a 1-inch tar pre-moulded joint is used in its place. The tar paper joints are placed by a rather unusual method devised by J. E. Mincher, engineer in charge for the state. The usual method is to wrap the paper around the steel joint insert, fastening it with wire to hold it in place until the insert can be removed. On this job, paper 32 inches wide is used. This is folded to give two 12-inch and one 8-inch folds, the folded paper being placed against the concrete in the shape of an L, the two 12-inch folds

forming the vertical part of the letter and the 8-inch fold the base. Folded in this manner, the paper holds well to the insert without wiring, prevents dirt and concrete from getting between the flaps and insures the joint from pulling out when the steel insert is removed, as the 8-inch flap acts as an anchor.

The old road was not in bad condition and the stone in it was bound very firmly. In order to take advantage of this and secure as firm a foundation as possible, the specifications called for nothing more than a loosening and scarifying of the top part, leveling and rolling in preparation for the concrete surface. A Hvass scarifier drawn by a Kelly-Springfield 10-ton steam roller with spiked wheels was used for loosening the top surface, which was then removed by pick and shovel, redistributed to fill all depressions and inequalities



FOOTE CONCRETE MIXER ON CONCRETE PAVEMENT CONSTRUCTION.



and to make a flat subgrade, and rolled thoroughly. An attempt was made to use a road scraper for this work of redistributing the material, but the stone was so firmly bound that it was ineffective. The grading gang was usually made up of ten or twelve men, but this number was increased or diminished as the men were needed on other parts of the work.

The haul varied from 2 to 4 miles, but averaged about three miles for the sand, stone and cement. Most of the hauling was done by motor trucks, but some was done by teams. The contractor owned a 5-ton Packard truck and this was used most of the time, as was a 2-ton Federal which was rented. Several teams were hired, also. The sand and stone were loaded into the trucks direct from the cars, four shovelers usually being assigned to a car. The time to load the 5-ton truck was usually about 20 to 25 minutes, the men ordinarily handling a ton of stone in 4 or 5 minutes.

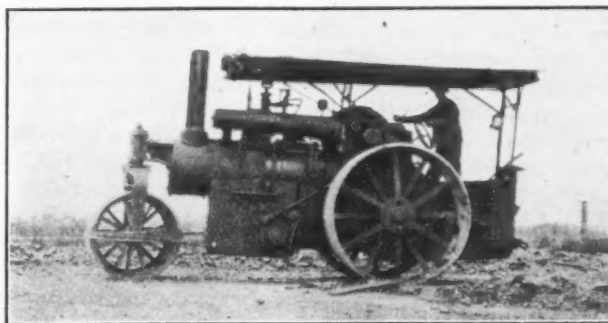
No cost records were kept on the Packard truck; a rental of \$12 a day was paid for the use of the Federal truck and teams were hired at the rate of \$7 per day. The big truck made seven trips a day, hauling between 5 and 6 tons of sand or stone or 120 bags of cement, almost 6 tons. The 2-ton truck made eleven trips a day loaded to full capacity. The teams took two slightly over two tons per trip and made four trips a day.

On this basis the teams hauled about nine tons each per day at a cost of \$7 or at the rate of 78 cents per ton delivered at the work. The 2-ton truck carried 22 tons at a cost of \$12 or at the rate of 54½ cents per ton at the work. The 5-ton truck delivered forty tons a day. As stated before, no costs were kept, but it may be estimated at from \$20 to \$25 per day, which would make the cost about the same as that for the smaller truck and would place both trucks considerably below the cost of hauling by horses.

Traffic had to be maintained until the work of concreting had begun, so the sand and stone was dumped along one side of the road, in alternate piles. This arrangement is usually a little less handy in concreting than where the piles are on opposite sides of the road, but has the advantage that, in case the supply runs short, there

is room to bring up a wagon with an additional load at any time, a thing not easy when the whole road is blocked.

The concreting gang usually comprises about 30 men. A Foote 6A mixer, ¾-yard batch, 14 to 16 revolutions, with a chute distributor, is used. The mix of 1:1½:3 calls for 4 bags of cement, 2 barrows of sand and 4 of stone, the barrows holding three cubic feet each. The gang is made up as follows: one foreman, one engineer, one fireman, one man cleaning up around mixer and general utility, two men taking care of the forms, four men placing concrete, two men screening and handling the



KELLY-SPRINGFIELD ROLLER ON SUB-GRADE.

template, one man finishing, three men on the cement, one opening, one dumping and the other handling bags; two men wheeling sand, two men shoveling sand, four men wheeling stone, and eight men shoveling stone. Just at present the non-delivery of cement has caused a postponement of concreting work.

Water for mixing and curing the cement is secured from the Watervliet city water system. Two 1¼-inch taps were made in a 24-inch main and these connected to a 2-inch line 3,000 feet long, which is then reduced to 1½ and finally to 1 inch, this section being about 3,000 feet long. As the water in the city system has practically no head, a "Domestic" pumping unit of 3½ horse power was installed to force the water through the mains. No standpipes are used, but a safety or blow-off valve has been installed near the pump. This is set to release at about 130 pounds.



GRADING AND ROLLING IN PREPARATION FOR CONCRETING.

To surely eliminate troubles due to poor drainage, 2,995 feet of drain tile were installed along the sides of the road and under it in the form of lateral drains. Most of it was laid about a foot outside the edge of the road in a trench three feet deep. The pipe was laid with burlap joints, open, and the trenches filled with broken stone to aid in drainage. Six-inch clay pipe was used throughout.

There are several bad curves on the road. Almost all of these were banked to a greater or less extent. One reverse curve presented a serious problem. The first curve, about 200 feet long, was banked 9 inches at the highest part. The reverse part of the curve was banked 7 inches. The concrete surface was also widened on the curves, at one point from 16 to 24 feet. In laying the concrete on this section, an 8-inch straight-edge was fastened to the inside end of the template. This had the effect of throwing the center of the road toward the outside. To this was added the amount of banking.

The contractor on the work is Thomas F. Shaughnessy of Watervliet. The work is being done under the direction of H. O. Schermerhorn, division engineer for the New York Highway Department. J. E. Mincher is engineer in charge and J. Schuman is assistant engineer.

### ROAD CENSUS IN IOWA.

#### Method and Result of Census to Secure Data Concerning Number, Weight and Class of All Vehicles and Kinds of Tires Used.

A road census has been taken at a number of points on the highways of the state of Iowa which differs from road censuses taken elsewhere in at least the one particular that all of the vehicles were actually weighed. This census has been taken by the experiment station of the Engineering Department of Iowa State College, co-operating with the Iowa State Highway Commission. The purpose of the census was to secure accurate data concerning the number of vehicles using the roads; the relative numbers of vehicles classified as farm traffic, interurban, and tourist traffic respectively; the relative numbers of motor vehicles and team traffic; and the character of tires used.

In order to obtain the exact weight, rather than estimate it as is the usual practice, those taking the traffic census were provided with a set of farm scales capable of weighing any ordinary load transported over the public highways. The scales were set on one side of the road, occupying about one-half of the roadway. Each vehicle, as it passed, was signalled to stop and requested to drive onto the scales, the driver being informed of the purpose. He was also asked questions necessary to furnish the information required for filling in the blanks, viz.: whether the vehicle was in farm traffic, in interurban traffic, or was touring.

The census was taken at each point during a period of 7 days, except that 10 days were spent at one station. Figures from eight stations have already been made public and reveal some interesting and a few unexpected figures.

All of the roads on which counts were taken were dirt roads except one gravel road leading to an army cantonment. In all, the count made covered 59 days and during this time there passed over the roads 1,847 horse-drawn vehicles and 20,602 motor vehicles. This gives an average of 387 vehicles on each road per day. The number of passengers in these averaged 1,259.

As road builders estimate that under the best conditions the maximum traffic which dirt roads will sustain

without undue maintenance cost is about 200 average vehicles per day, one conclusion from this census is that these dirt roads should receive a more permanent surface.

The relative number of horse-drawn and motor vehicles was one of the former to 11.2 of the latter; although the ratio varied from 1 to 1.8 on one road to 1 to 92.7 on another.

In the matter of tires there were 8.3 per cent. as many steel as rubber tires. In the matter of freight hauling, there passed the eight stations 770 motor trucks and 683 horse-drawn freight vehicles, indicating that for heavy hauling the motor vehicles were in the lead, although this was a period when large amounts of farm produce were being hauled.

Only 290 passenger vehicles drawn by two horses were recorded, to 17,262 touring cars; and 763 one-horse passenger vehicles to 2,344 roadster motor cars. Only 145 bicycles passed all eight stations during the 59 days, and the same number of motorcycles.

The ratio between farm, interurban and tourist traffic, it was believed, should have a bearing upon the distribution of taxes for road building and maintenance. Averaging the eight stations, farm traffic constituted only 10 per cent of the total and tourist traffic only 3 per cent; and on this basis it was concluded by the investigators that 87 per cent of the cost of the highways should be borne by city, town or general state taxes rather than by farmers.

The users of the road were classified as follows: One-horse passenger, one-horse freight, 2-horse passenger, 2-horse freight, 4-horse drags, 4-horse freight, roadsters, touring cars, motor trucks, motorcycles, tractors, bicycles, saddle-horses, pedestrians, planters, hay-rakes, wagon gears, 3-horse passenger, 7-horse passenger, 25-horse machine, binder, hearse. Other data recorded were whether the vehicle was in farm, interurban, or tourist traffic, carrying freight, empty, number of passengers, carrying grain, coal, wood, hay, telegraph poles, junk, sand, cattle, merchandise, produce and oil.

### REMOVING OLD MACADAM.

Just outside of the city of Chicago, in Cook County, Ill., the badly worn macadam surface of West 95th street was recently removed to make way for a concrete road surface to be covered with 2 inches of asphalt. Under the macadam the subgrade was of gravel. No grading was required on this road to prepare it for the concrete except that necessary to prepare the subgrade, but to do this it was necessary to remove from 6 to 12 inches from the old road surface. It was proposed to construct a 3-ft. macadam shoulder on each side of the 16-ft. asphalt pavement, and to use the old macadam material for constructing such shoulders.



SCARIFYING AND REMOVING OLD MACADAM AT ONE OPERATION.



The ordinary method of removing the macadam would have been to use a rooter plow or scarifier, after which the loosened material would be removed by some other method. Instead of this, the contractors, John A. McGarry & Co., of Chicago, tried out a new machine known as a "Rip Snorter," which consists of a heavy frame carrying scarifier teeth fastened in front of a scraper blade which is 9 ft. long and covers a width of road about 5 ft. when set at the angle proper for moving the material to one side. This machine both rooted up the old macadam and moved it to one side of the road at a single operation. The outfit contained, in addition, a 25 h. p. steam traction engine which was handled by two men and used to draw the Rip Snorter, and a water wagon to serve the steam tractor. This outfit removed about 10,000 cu. yds. of material in three weeks. By careful adjusting of the blade, practically no additional dressing up of the subgrade was required before the placing of the new concrete base.

## APPLIANCES OWNED BY HIGHWAY AUTHORITIES.

### Machinery Owned and Operated by Counties and Townships in Many States and Used for Highway Construction and Repair.

**ARKANSAS.** Little River County—Several drags and graders.

**CALIFORNIA.** Butte Co.—5 drags, 10 graders, 10 2-wheel scrapers, several dump wagons, 2 gasoline rollers, 2 scarifiers, 3 stone crushers, 10 wheelbarrows, 100 shovels.

Kings Co.—3 drags, 3 graders, 6 dump wagons, 2 scarifiers, 1 engineer's level.

San Benito Co.—road drags, graders and levelers (numbers not given), 2 2-wheel scrapers, 3 4-wheel scrapers, 2 dump wagons, 1 roller, 1 scarifier, 1 stone crusher, 1 asphalt kettle.

San Joaquin Co.—13 drags, 6 graders, 3 levelers, 8 dump wagons, 2 rollers, 13 motor trucks 5 to ¾-ton each, 3 scarifiers, 1 concrete mixer, 2 motor-driven oil spreaders and flushers, 1 2-ton asphalt kettle and 10 15-gal. on asphalt kettles for patrol use, 6 wheelbarrows, 36 shovels, 3 engineer's transits, 3 engineer's levels and 1 Blaw culvert form.

**CONNECTICUT.** Twn. of Bloomfield—1 leveler, 1 2-wheel scraper, 1 4-wheel scraper.

Town of Clinton—1 drag, 2 4-wheel scrapers, 2 wheelbarrows, 6 shovels.

Town of Durham—4 drags and 2 graders.

Town of Eastford—2 drags, 2 4-wheel scrapers, 8 shovels.

Town of East Windsor—5 drags, 2 graders.

Town of Morris—1 drag, 2 graders.

Town of Plymouth—1 drag, 1 4-wheel scraper.

Town of Putnam—1 drag, 2 4-wheel scrapers.

Town of Southington—10 drags, 2 4-wheel scrapers.

Town of Stamford—1 drag, 1 grader, 1 4-wheel scraper, 1 steam drill, 36 wheelbarrows, 20 shovels.

Town of West Hartford—4 drags, 2 4-wheel scrapers, 1 steam roller, 1 stone crusher, 1 asphalt kettle, 1 1½-ton motor truck, 2 diaphragm pumps, 12 wheelbarrows, 1 engineer's level.

Town of Woodstock—2 drags, 1 grader, 1 2-wheel scraper, 3 4-wheel scrapers, 1 stone crusher, 3 wheelbarrows, 30 shovels, 1 engineer's instrument.

**FLORIDA.** Alachua Co.—2 drags, 2 graders.

Broward Co.—1 grader, 1 gasoline roller, 1 3-ton motor truck, 1 scarifier.

Calhoun Co.—2 graders, 4 2-wheel scrapers.

Lee Co.—1 grader, 1 leveler, 17 dump wagons, 1 road

roller, 5 5-ton motor trucks, 1 scarifier, 1 steam shovel, 15 wheelbarrows, 30 shovels, 4 engineer's instruments.

Levy Co.—5 drags, 3 graders, 20 slat-bottom wagons, 1 road roller, 1 scarifier, 20 wheelbarrows, 80 shovels, 1 engineer's transit, 1 engineer's level.

Osceola Co.—2 drags, 2 graders, 2 engineer's instruments.

St. Lucie Co.—8 drags, 6 graders, 1 leveler, 4 drag scrapers, 4 dump wagons, 1 gasoline roller, 2 scarifiers, 1 asphalt kettle, 2 diaphragm pumps, 2 wheelbarrows, 18 shovels.

**GEORGIA.** Bacon Co.—1 drag, 3 graders, 1 leveler, 3 dump wagons, 60 wheelbarrows, 1 shovel.

Chattahoochee Co.—5 drags, 1 grader.

Gordon Co.—3 drags, 2 graders, 1 tractor, 1 scarifier.

Heard Co.—13 graders, 10 2-wheel scrapers, 13 4-wheel scrapers, 200 shovels.

Liberty Co.—2 drags, 1 4-wheel scraper, 36 shovels.

Lowndes Co.—2 split-log drags, 4 graders, 7 dump wagons, 1 5-ton motor truck.

Putnam Co.—10 drags, 3 4-wheel scrapers, 3 dump wagons, 1 tractor, 1 stone crusher, several shovels.

Worth Co.—12 drags, 4 graders, 1 leveler, 20 2-wheel scrapers, 2 dump wagons, 1 tractor, 3 3-ton motor trucks, 1 scarifier, 30 shovels.

**INDIANA.** Clinton Co.—32 drags, 25 graders, 1 scarifier, 2 engineer's instruments.

Posey Co.—10 drags, 4 graders, 2 levelers, 36 wheelbarrows, 48 shovels, 1 engineer's transit, 1 engineer's level.

**IOWA.** Johnson Co.—50 drags, 6 graders, 2 concrete mixers, 3 diaphragm pumps, 15 wheelbarrows.

Plymouth Co.—40 drags, 4 graders, 6 2-wheel scrapers, 1 tractor, 1 concrete mixer, 12 wheelbarrows, 40 shovels, 3 engineer's instruments.

Webster Co.—60 drags, 2 graders, 2 levelers, 22 2-wheel scrapers, 14 dump wagons, 2 tractors.

**KANSAS.** Sedgwick Co.—50 drags, 6 graders, 2 levelers, 10 2-wheel scrapers, 7 dump wagons, 2 tractors, 1 scarifier, 1 concrete mixer, 1 motor-driven oil spreader, 2 engineer's instruments.

**KENTUCKY.** Greenup Co.—12 drags, 3 graders, 10 2-wheel scrapers, 1 steam roller, 1 stone crusher, 20 shovels, 2 engineer's transits, 1 engineer's level.

**LOUISIANA.** Caddo Parish—10 drags, 20 graders, 15 2-wheel scrapers, 1 gasoline roller, 1 steam roller, 1 tractor, 1 1-ton motor truck, 1 5-ton motor truck, 1 6-ton motor truck, 1 scarifier, 1 motor-driven oil spreader, 2 asphalt kettles, 12 wheelbarrows, 6 dozen shovels, 4 engineer's instruments.

Catahoula Co.—2 drags, 8 graders, 1 tractor.

Morehouse Co.—4 drags, 2 graders, 1 leveler, 1 tractor, 16 shovels.

Tangipahoa Co.—10 drags, 8 graders.

**MARYLAND.** Baltimore Co.—5 drags, 13 graders, 10 4-wheel scrapers, 16 road rollers, 5 1-ton motor trucks, 2 scarifiers, 4 concrete mixers, 4 stone crushers, 2 motor-driven oil spreaders, 16 asphalt kettles, 2 diaphragm pumps, 1 steam drill, 50 wheelbarrows, 200 shovels, 3 engineer's instruments.

Charles Co.—9 drags, 5 graders.

Queen Anne's Co.—40 drags, 6 graders, 6 2-wheel scrapers, 20 dump wagons, 2 steam rollers, 6 wheelbarrows, 50 shovels, 1 engineer's transit, 1 engineer's level.

Talbot Co.—20 drags, 1 leveler, 5 4-wheel scrapers, 4 dump wagons, 1 steam roller, 2 scarifiers, 1 diaphragm pump, 4 wheelbarrows, 50 shovels, 1 engineer's transit, 1 engineer's level.

Wicomico Co.—25 to 50 drags, 10 graders, 12 2-wheel scrapers, 2 steam rollers, 1 asphalt kettle, 6 to 12 wheelbarrows, 24 shovels, 1 engineer's instrument, 1 set of concrete forms.

MINNESOTA. Hubbard Co.—21 drags, 1 grader, also 1 tractor and engineer's instrument, owned by the road official personally.

MISSISSIPPI. Chickasaw Co.—1 drag, 2 graders, 1 leveler, 3 dump wagons, 8 shovels.

Choctaw Co.—2 drags, 2 graders, 2 levelers.

Forrest Co.—2 drags, 2 graders, 6 2-wheel scrapers, 1 dump wagon, 1 tractor, 1 motor truck, 4 wheelbarrows.

Hancock Co.—2 drags, 2 graders, 12 shovels, 1 engineer's instrument.

Issaquena Co.—10 drags, 6 graders, 1 5-ton motor truck.

Itawamba Co.—6 drags, 2 graders.

Jackson Co.—2 drags, 3 graders, 2 tractors, 4 wheelbarrows, 6 shovels, 1 engineer's instrument.

Jones Co.—5 drags, 7 graders, 10 2-wheel scrapers, 5 dump wagons, 1 tractor, 4 motor trucks, 12 wheelbarrows, 50 shovels.

Leake Co.—2 graders.

Madison Co.—8 graders.

Oktober Co.—12 drags, 2 graders, 10 two-wheel scrapers.

Pontotoc Co.—2 drags.

Sharkey Co.—30 to 40 drags, 6 graders, 2 tractors.

Simpson Co.—5 graders, 20 shovels.

Stone Co.—2 drags, 5 graders, 1 scarifier, 12 wheelbarrows, 40 shovels.

Tallahatchie Co.—8 drags, 8 graders, 1 5-ton truck.

Winston Co.—2 drags, 3 graders, a number of two-wheel scrapers, 2 tractors, 2 motor trucks.

MISSOURI. Monroe Co.—6 drags, 45 graders, 1 leveler, 6 2-wheel scrapers, 1 horse roller, 2 tractors, 3 rooter plows, 2 concrete mixers, 1 stone crusher, 1 steam drill, 10 wheelbarrows, 25 shovels, 2 engineer's instruments.

Ray Co.—100 drags, 20 graders, 2 levelers, 4 2-wheel scrapers, 2 dump wagons, 1 tractor, 2 motor trucks.

NEW JERSEY. Burlington Co.—2 levelers, 3 2-wheel scrapers, 8 4-wheel scrapers, 2 steam rollers, 1 2½-ton motor truck, 1 5-ton motor truck, 1 motor-driven oil spreader, 3 asphalt kettles, a large number of shovels.

OHIO. Defiance Co.—1 drag, 2 graders, 2 steam rollers, 3 scarifiers, 1 asphalt kettle, 5 engineer's instruments.

Gallia Co.—2 graders, 1 steam roller, 1 scarifier, 1 stone crusher, 2 wheelbarrows.

Guernsey Co.—40 drags, 20 graders, 15 2-wheel scrapers, 2 gasoline rollers, 4 scarifiers, owned by townships; also 10 rollers, 1 stone crusher, 2 asphalt kettles, 15 wheelbarrows and 40 shovels owned by county.

Madison Co.—15 drags, 10 graders, 2 engineer's transits, 1 engineer's level.

Ottawa Co.—2 engineer's transits, 3 engineer's levels.

OKLAHOMA. Jackson Co.—15 drags, 3 graders, 2 tractors, 1 engineer's transit, 1 engineer's level.

PENNSYLVANIA. Allegheny Twp.—4 drags, 3 graders, 4 shovels.

Allensville Twp.—2 dump wagons, 1 stone crusher, 4 wheelbarrows.

Amity Twp.—1 leveler, 1 scraper, 1 stone crusher, 15 shovels.

Annin—10 drags, 2 graders, 1 2-wheel scraper, 1 steam roller.

Anthony Twp.—4 drags, 2 graders, 1 set of concrete forms.

Beaver Twp.—12 drags, 1 2-wheel scraper, 3 4-wheel scrapers, 1 steam roller, 1 conc. mixer, 6 wheelbarrows, 12 shovels, 6 conc. forms.

Bedminster Twp.—6 drags, 2 4-wheel scrapers, 1 steam roller, 1 tractor, 1 stone crusher, 6 shovels, 1 conc. form.

Bell Twp.—5 drags, 2 graders.

Benton Twp.—4 drags, 4 4-wheel scrapers, 1 tractor, 12 shovels.

Berwick Twp.—1 drag.

Black Lick Twp.—6 drags, 3 graders, 1 2-wheel scraper, 3 4-wheel scrapers, 10 shovels.

Horton Twp.—20 drags, 3 graders, 2 wheelbarrows, 20 shovels, 1 conc. form.

Brush Creek Twp.—2 drags, 1 grader, 6 shovels.

Butler Twp.—4 drags, 2 graders, 1 conc. form.

Ceres Twp.—4 drags, 4 graders.

Chaneyville Twp.—2 drags, 2 wheelbarrows, 6 shovels.

Chester Twp.—2 wheelbarrows, 12 shovels, 6 rakes, 6 conc. forms.

Coburn Twp.—1 4-wheel scraper, 3 wheelbarrows, shovels and conc. form.

Cochran Mills Twp.—6 drags, 1 grader.

Conemaugh Twp.—3 drags, 1 4-wheel scraper, 1 road roller, 1 stone crusher, 2 wheelbarrows, 3 shovels.

Cowanshannoc Twp.—30 drags, 3 graders.

Danville Twp.—4 drags, 2 graders, 2 scrapers.

East Drumore Twp.—8 drags, 2 graders.

Eagles Mere Twp.—12 drags, 3 graders, 1 2-wheel scraper, 2 wheelbarrows, 10 shovels, 1 conc. form.

East Hanover Twp.—12 drags, 3 graders, 1 2-wheel scraper, 1 scarifier, 1 stone crusher, 2 wheelbarrows, 6 shovels, 4 conc. forms.

Elverson Twp.—1 drag, 1 scraper, 1 stone crusher, 6 shovels.

Endeavor Twp.—3 drags, 1 2-wheel scraper, 2 4-wheel scrapers, 4 wheelbarrows, 12 shovels.

Fairfield Twp.—3 drags, 2 graders, 1 2-wheel scraper.

Findlay Twp.—12 drags, 3 graders, 1 2-wheel scraper, 5 4-wheel scrapers.

Franklin Twp.—3 drags, 2 graders, 1 2-wheel scraper, 1 steam roller.

Frederick Twp.—3 drags, 1 grader, 1 4-wheel scraper, 1 stone crusher, 5 wheelbarrows, 8 shovels.

Fulton Twp.—25 drags, 2 graders, 3 2-wheel scrapers, 1 conc. form.

Gowen City Twp.—2 drags, 1 stone crusher, 5 wheelbarrows, 12 shovels.

Granville Twp.—10 drags, 4 graders, 1 conc. mixer, 4 wheelbarrows, 25 shovels.

Greene Twp.—8 drags, 3 graders, 1 tractor, 1 conc. mixer, 1 wheelbarrow.

Half Moon Twp.—3 drags, 1 grader, 1 2-wheel scraper, 1 4-wheel scraper, 1 stone crusher, 5 wheelbarrows.

Hanover Twp.—3 drags, 2 4-wheel scrapers.

Harbor Creek Twp.—10 drags, 5 graders, 2 2-wheel scrapers, 1 steam roller, 5 wheelbarrows, 6 shovels.

Henderson Twp.—1 grader, 1 scraper, 1 scarifier.

Henry Clay Twp.—2 graders, 1 road roller.

Hickory Twp.—9 drags, 3 graders, 1 leveler, 1 2-wheel scraper, 3 4-wheel scrapers, 1 tractor, 1 conc. form.

Horton Twp.—4 drags, 4 graders.

Independence Twp.—3 drags, 1 grader, 2 2-wheel scrapers, 2 4-wheel scrapers.

Industry Twp.—1 grader, 3 levelers.

Jackson Twp.—3 drags, 5 4-wheel scrapers, 12 shovels.

Jeffersonville Twp.—1 4-wheel scraper, 12 shovels.

Jones Twp.—3 drags, 3 graders.

Julian Twp.—4 drags, 5 shovels.

Juniata Twp.—3 drags, 1 4-wheel scraper, 1 scarifier.

Kimmell Twp.—2 drags, 2 graders, 6 shovels.

Laidig Twp.—6 drags, 1 grader, 1 leveler, 6 shovels.

Lumber Twp.—2 drags, 1 2-wheel scraper, 1 4-wheel scraper, 5 wheelbarrows, 10 shovels.

Luzerne Twp.—6 drags, 2 graders, 13 dump wagons, 4 road rollers, 2 conc. mixers, 2 stone crushers, 1 asphalt kettle, 1 steam drill, 12 wheelbarrows.

Marienville Twp.—2 drags, 2 4-wheel scrapers, 1 tractor, 6 shovels.

McHenry Twp.—2 drags, 2 graders, 10 shovels.



Milroy Twp.—6 drags, 1 4-wheel scraper, 4 dump wagons, 1 road roller, 1 stone crusher, 6 wheelbarrows, 20 shovels.

Mt. Bethel Twp.—7 drags, 3 graders, 1½-ton motor truck, 1 stone crusher, 2 dozen shovels, 2 sets concrete forms.

Neshannock Twp.—3 drags, 3 graders.

New Garden Twp.—4 drags, 2 4-wheel scrapers, 2 wheelbarrows, 12 shovels.

New London Twp.—4 drags, 1 2-wheel scraper, 2 4-wheel scrapers, 2 dump wagons.

New Wilmington Twp.—11 drags, 2 4-wheel scrapers.

Nicktown Twp.—6 drags, 3 graders, 1 leveler.

Northampton Twp.—22 drags, 2 4-wheel scrapers, 4 dump wagons, 1 steam roller, 2 wheelbarrows, 12 shovels, 1 set of conc. forms.

North Towanda Twp.—1 drag, 2 4-wheel scrapers.

Ontelaunee Twp.—1 drag, 1 leveler, 1 4-wheel scraper, 1 stone crusher, 6 wheelbarrows, 6 shovels.

Patton Twp.—2 drags, 1 grader, 1 scarifier, 1 stone crusher, 6 wheelbarrows, 12 shovels.

Perry Twp.—3 drags, 2 graders.

Philipsburg Twp.—3 drags, 2 4-wheel scrapers, 12 shovels.

Pillow Twp.—4 drags, 1 4-wheel scraper, 1 stone crusher, 4 wheelbarrows, 1 concrete form.

Pine Creek Twp.—2 drags, 1 scraper, 4 wheelbarrows, 6 shovels.

Plum Creek Twp.—20 drags, 4 graders.

Plumstead Twp.—12 drags, 2 graders, 1 steam roller, 1 stone crusher.

Plymouth Twp.—1 stone crusher.

Portage Twp.—1 drag, 1 grader.

Rebersburg Twp.—1 drag, 1 grader, 1 4-wheel scraper, 1 steam roller, 1 tractor, 1 scarifier, 1 stone crusher.

Rockfeller Twp.—6 drags, 1 4-wheel scraper, 1 stone crusher, 1 wheelbarrow, 12 shovels.

Rush Twp.—4 drags, 3 4-wheel scrapers.

Salem Twp.—5 drags, 2 graders, 1 2-wheel scraper.

Salisbury Twp.—8 drags, 2 graders, 2 levelers, 2 4-wheel scrapers, 1 road roller, 1 stone crusher, 1 diaphragm pump, 5 wheelbarrows, 25 shovels, 2 conc. forms.

Saltlick Twp.—1 drag, 1 grader, 1 4-wheel scraper, 1 steam roller.

Sandy Creek Twp.—10 drags, 2 graders.

Sandy Lake Twp.—20 drags, 3 graders, 4 2-wheel scrapers.

Sinmahoning Twp.—3 drags, 2 scrapers, 1 wheelbarrow, 12 shovels.

Slippery Rock Twp.—6 drags, 3 graders, 3 levelers, 2 wheelbarrows, 6 shovels, 2,000 feet concrete forms.

Snyder Twp.—3 drags, 1 grader, 1 leveler, 1 2-wheel scraper, 3 dump wagons.

Sparta Twp.—6 drags, 5 graders, 1 2-wheel scraper, 1 tractor, 3 wheelbarrows, 12 shovels, 3 sets of wood conc. forms.

Spring Twp.—12 drags, 6 graders, 4 2-wheel scrapers, 6 4-wheel scrapers, 6 wheelbarrows.

St. Boniface Twp.—4 drags, 1 grader.

Stillwater Twp.—2 drags, 1 grader, 1 2-wheel scraper.

Summit Twp.—3 drags, 4 graders, 1 2-wheel scraper.

Susquehanna Twp.—1 drag, 1 grader.

Thornbury Twp.—2 drags, 1 grader, 2 levelers, 4 4-wheel scrapers, 4 shovels.

Transfer Twp.—3 drags.

Tyrone Twp.—4 drags, 1 grader, 2 dump wagons, 1 road roller, 1 scarifier, 2 stone crushers, 1 steam drill, 3 wheelbarrows, 12 shovels.

Ulster Twp.—3 drags, 3 graders, 6 shovels.

Union Twp.—1 drag, 2 2-wheel scrapers, 2 4-wheel scrapers, 13 shovels.

Upper Chichester Twp.—2 drags, 1 grader, 1 stone crusher, 20 shovels.

Upper Unchland Twp.—3 drags, 2 graders.

Wallace Twp.—2 drags, 1 grader.

Washington Twp.—16 drags, 2 graders, 6 shovels.

Waterford Twp.—15 drags, 6 graders, 2 2-wheel scrapers, 1 steam roller, 1 conc. mixer, 2 wheelbarrows.

Waterville Twp.—2 drags, 1 grader, 6 shovels.

Wayne Twp.—13 drags, 3 graders.

Weisenburg Twp.—8 drags, 2 graders, 1 stone crusher.

Wells Twp.—3 drags, 3 graders, 3 levelers, 6 bail scrapers.

West Burlington Twp.—6 drags, 1 grader.

West Farmington Twp.—10 drags, 1 2-wheel scraper, 10 shovels.

West Mead Twp.—12 drags, 4 graders, 1 2-wheel scraper, 12 shovels.

Whiteley Twp.—6 drags, 4 graders.

Willistown Twp.—1 grader, 6 dump wagons, 1 steam roller, 5 wheelbarrows, 30 shovels.

Winfield Twp.—12 drags, 1 grader, 3 4-wheel scrapers, 2 doz. shovels.

Young Twp. (Jefferson County)—3 drags, 3 graders, 3 levelers.

Young Twp. (Indiana County)—8 drags, 2 graders, 1 4-wheel scraper, 3 dump wagons, 3 wheelbarrows, 20 shovels.

SOUTH CAROLINA. Cherokee Co.—18 drags, 6 graders, 10 2-wheel scrapers, 1 scarifier, 12 wheelbarrows, 3 doz. shovels.

Marlboro Co.—12 drags, 5 graders, 1 scarifier, 12 wheelbarrows, 100 shovels.

TENNESSEE. Carroll Co.—12 drags, 100 graders, 12 wheelbarrows.

Madison Co.—57 drags, 13 graders, 30 levelers, 10 wagons, 1 scarifier, 100 shovels, 1 engineer's transit, 1 engineer's level, 1 conc. bridge form.

TEXAS. Armstrong Co.—12 drags, 3 graders, 1 leveler, 1 tractor.

Briscoe Co.—2 graders.

Brown Co.—40 drags, 6 graders, 20 two-wheel scrapers, 1 road roller, 1 scarifier, 12 wheelbarrows.

Castro Co.—4 drags, 1 grader.

Chambers Co.—2 drags, 2 graders, 2 tractors.

Culberson Co.—2 drags, 2 graders, 1 tractor, 1 conc. mixer.

Dallas Co.—50 drags, 15 graders, 3 steam rollers, 1 tractor, 2 scarifiers, 50 wheelbarrows, 150 shovels, 4 engineer's instruments.

Deaf Smith Co.—20 drags, 4 graders, 3 2-wheel scrapers, 2 tractors, 3 engineer's instruments.

Dimmit Co.—8 drags, 4 graders, 3 2-wheel scrapers.

El Paso Co.—16 drags, 3 graders, 2 levelers, 12 dump wagons, 2 road rollers, 1 conc. mixer, 2 asphalt kettles, 8 wheelbarrows.

Frio Co.—4 drags, 4 graders, 6 2-wheel scrapers, 2 tractors, 6 wheelbarrows, 12 shovels.

Gillespie Co.—40 drags, 10 graders, 4 2-wheel scrapers, 8 dump wagons, 1 gasoline roller, 1 tractor, 1 scarifier, 200 shovels.

Haskell Co.—45 drags, 8 graders, 6 2-wheel scrapers.

Hunt Co.—40 drags, 5 graders, 3 tractors, 3 motor trucks.

Jim Wells Co.—20 drags, 4 graders, 1 road roller, 1 tractor, 10 wheelbarrows.

Jones Co.—12 drags, 12 graders, 6 2-wheel scrapers, 6 wheelbarrows.

Lipscomb Co.—8 drags, 7 graders.

Live Oak Co.—4 drags, 4 graders, 6 2-wheel scrapers.

Lubbock Co.—8 drags, 2 graders.

Madison Co.—5 drags, 5 graders, 5 Fresno scrapers, 50 slip scrapers.

Marion Co.—6 drags, 3 graders.

Martin Co.—1 drag, 1 grader.  
 Moore Co.—2 drags, 1 grader.  
 Ochiltree Co.—10 drags, 4 graders, 6 shovels.  
 Shelby Co.—6 drags, 8 graders, 6 2-wheel scrapers, 3 tractors.  
 Stonewall Co.—15 drags, 6 graders, 12 2-wheel scrapers.  
 Taylor Co.—30 drags, 5 graders, 8 2-wheel scrapers, 4 dump wagons, 1 steam roller, 2 wheelbarrows, 24 shovels, 1 set of conc. forms.  
 Tyler Co.—12 drags, 3 graders, 2 levelers, 8 2-wheel scrapers.  
 Val Verde Co.—6 drags, 3 graders, 1 tractor, 1 stone crusher.  
 Zavalla Co.—4 drags, 4 graders, 16 rollers.  
 VIRGINIA. Halifax Co.—14 drags, 7 graders, 20 2-wheel scrapers, 1 diaphragm pump, 6 wheelbarrows, 100 shovels, 1 engineer's level.  
 WASHINGTON. Douglas Co.—20 drags, 10 graders,

15 2-wheel scrapers, 10 dump wagons, 1 stone crusher, 50 shovels, 2 engineer's transits, 1 level.

Pierce Co.—8 drags, 5 graders, 8 2-wheel scrapers, 8 dump wagons, 1 road roller, 2 tractors, 3 motor trucks, 3 to 5 tons, 1 scarifier, 2 conc. mixers, 2 stone crushers, 1 steam shovel, 1 asphalt kettle, 6 industrial cars, 20 wheelbarrows, 60 shovels, 3 engineer's transits, 3 levels.

Snohomish Co.—25 drags, 3 graders, 6 2-wheel scrapers, 10 dump wagons, 2 steam rollers, 1 tractor, 1 5-ton motor truck, 1 scarifier, 1 stone crusher, 1 asphalt kettle, 20 wheelbarrows, 50 shovels, 4 engineer's transits, 7 levels.

Skamania Co.—10 drags, 5 graders, 20 2-wheel scrapers, 2 road rollers, 3 stone crushers, 2 engineer's instruments.

WEST VIRGINIA. Raleigh Co.—1 3-ton motor truck and 1 5-ton truck, 8 engineer's instruments.

WISCONSIN. Trempealeau Co.—120 drags, 30 graders, 2 levelers, 50 2-wheel scrapers, 3 dump wagons, 3 road rollers, 74 shovels, 2 engineer's instruments.

## TOWN AND COUNTY HIGHWAY DATA

Data Concerning Town and County Road Construction in Many of the States—Amount of Work Done and Types of Roads Built—Construction Details and Costs—Surface Treatment.

The following information concerning town and county road work has been furnished to Municipal Journal by the town and county highway officials. The information is, in a way, supplementary to that concerning state and county work given in the April 5th issue of Municipal Journal, but in the present number especial attention has been paid to highway work done in the smaller political divisions of those states where road work, owing to favorable weather, can be carried on during all or most of the year. Information is also included from those counties in the northern states which, at the time the information

for the State and County Road Number was being collected, had not yet made their plans for the season. Also, a special effort was made to get information from Connecticut and Pennsylvania, where practically all the work not done by the state comes under the direction of the township officials. Under Pennsylvania and Connecticut, therefore, the information given relates to the work done in the various townships. A great many townships informed us that no work had been done by them this year, and their names do not appear in the table or list of appliances owned.

TABLE NO. 1-A—AMOUNT OF HIGHWAY BUILT DURING 1917.

Including work now under way. Amounts are in miles or square yards—the size of each number indicates which.

State and County.	Brick				Concrete				Rein- forced?	Bituminous			Concrete		Bitulithic		
	Am't.	Width.	Depth of Cushion.	Kind of Filler.	Am't.	Width.	One or 2- course.	Thick- ness.		Am't.	Width.	Thick- ness.	Am't.	Width.	Thick- ness.	Am't.	Width.
<b>California:</b>																	
Contra Costa...					31C	18	1	5	Partly							1	16&24
San Joaquin...					93,358C	18	1a	4	None								
Santa Clara...	3,378C	18	None	Grout	62.1	16	1	4	None								
Ventura .....					11.1	18			None								
<b>Connecticut:</b>																	
Clinton .....					0.25C	24											
Plymouth .....					1.0D	18				1.0		2					
Wallingford .....						33	1										
<b>Florida:</b>																	
Osceola .....	4.5	9								25C	16&9	9					
St. Lucie .....																	
<b>Maryland:</b>																	
Baltimore .....					15	15to42	1	6	None								
Queen Anne's...					32,035C	14	1	7&5	None								
Talbot .....					7	15		6	None								
<b>Mississippi:</b>																	
Pontotoc .....	40	14															
<b>New Jersey:</b>																	
Burlington .....					2	18	1	7									
<b>Ohio:</b>																	
Defiance .....					4.0	15	1	7	Yes								
Guernsey .....	7C	16	6	Grout	5.5	15	1	7	None								
<b>Oklahoma:</b>																	
Jackson .....																12,243C	70
Madison .....	4,545C	36	2	Grout													
Ottawa .....	1.0D	16&20	1½	Mastic	0.75C		1	6&8	Yes								
<b>Pennsylvania:</b>																	
Luzerne .....	12	14	1														
New Wilm'gton.					2.5C	16											
Salisbury .....										2D	8	6					
Thornbury .....	0.12	14															
<b>Texas:</b>																	
Dallas .....					6.5C	16,18&20	2	6%	Yes								
El Paso .....					15C	18	1	7	None							21C	16
Hunt .....	40	8&14															
<b>Washington:</b>																	
Pierce .....	0.744C	16	1½	Sand	24.28CD	16&17	1	5to8	None	6.06C	17	1b	19.21C	16&17			
Snohomish .....					65C	9&16	1	5to7	In low spots								

a, With 1½ in. Topeka top; b, 1-in. top on 5-in. base; c, by contract; d, by department.



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## COST-PLUS-PERCENTAGE CONTRACTS.

Attention has been called time and again to the extreme probability that a municipality which includes uncertainties or risks in a contract will be required by the contractor to pay a premium on these in the contract prices. In other words, no sensible contractor who knows his business will assume unusual risks in a contract without adding a sufficient amount to the price to adequately protect himself in the risk. It is therefore generally advisable for cities to assume such risks themselves as far as possible, as this will generally be cheaper in the long run and will make the contract attractive to a larger number of bidders.

At the present time there is an unusual risk in most contract work caused by uncertainties of prices for material, of wages, and of the ability to obtain labor in the desired quantities. A number of cities, counties and states have recognized this as being an unusual risk and therefore subject to the objections attached to such when embodied in contracts, and have eliminated them from their contracts so far as possible. The method ordinarily employed for so eliminating them is to arrange for having work done on the cost-plus-percentage basis. By far the largest contracts let recently on this plan have been for the army cantonments, all of which were let by the government on this basis. The advisability of arranging for highway and other construction work to be done along the same lines is suggested as worthy of serious consideration. For many years road work has been carried on in Los Angeles County, California, by such a method, termed there "Force Account Contracts"; the county furnishes all the material and carries all the labor

on its payrolls, while the contractor furnishes the equipment and management.

In making such arrangements for work it is important to consider not only the ability of the contractor to do work in an acceptable manner and at reasonable cost, but also his honesty and the probability that he will use his best endeavors to keep the cost as low as possible even though doing so is not to his immediate financial advantage. On this point the road commissioner of Los Angeles County, H. F. Joyner, said recently: "It is my experience that the character and ability of the contractor and also of the road commissioner or highway engineer appointed by the county to look after its interests are of greater importance than the exact form or wording of the contract. An honest, capable contractor and an honest, capable engineer will construct a good, honest, economical highway, regardless of many of the details of the contract; while if the contractor and engineer are dishonest or incapable, the roads will be poorly and expensively constructed, regardless of the requirements of the signed contract."

To contractors we suggest that they consider well the desirability of establishing a reputation for keeping the cost of work at a minimum when performed by them on the cost-plus-percentage basis. There will probably be considerable work done in this way in the future, even though prices and labor conditions become more settled; and aside from this, such a reputation is likely to give to those employing the contractor a confidence in his essential honesty and a desire to have further business dealings with him, even though he may not always be the lowest bidder on the basis of the itemized bids received at future lettings. Although there are still too few municipal officials who realize that some contractors are honest and that such honesty is as valuable an element in dealing with them as in dealing with any other business man, still, the truth of this is gradually being learned and we hope that appreciation of it will rapidly become general.

## LABOR AVAILABLE FOR ROAD WORK.

The number of laborers is insufficient to meet the unusual demands in most sections of the country at present, and yet there are thousands of able-bodied men who are doing no useful work, and are prevented from doing so by local or federal government. It would certainly seem as though the authorities, instead of maintaining them in idleness at the expense of the taxpayers, should utilize their labor in the most effective way possible. Several states have done considerable along this line, but the use of convicts is not nearly so extensive and general as it might be. Road construction, including quarrying stone for this purpose, seems to offer the best avenue for the use of unskilled labor and even of several classes of skilled labor; partly, at least, because it is least objectionable to labor unions, since it involves minimum competition with free labor.

The successful use of convicts on California road work has been reported from time to time, but some definite figures of the economies attained by such work have recently been made public by Charles F. Stern, one of the state highway commissioners. About 33 miles of difficult mountain road have been finished recently in Mendocino county. The engineers estimated that the work would cost from \$335,000 to \$400,000; it was completed for \$200,000. The grading required the removal of about 200,000 yards of material, over half of it rock, which the engineers figured would cost about 40 cents a yard to handle. Convict labor cut that cost nearly in half. In reaching the actual costs, every item of expense is included, clothing, transportation, food, camp equip-

ment and medical attention. The cost of guarding is not included, for the reason that in California the convict road camps are honor camps, and the representatives of the prison authorities are unarmed, their duties being supervisory. The men are treated like free laborers, on and off duty, and the result of this policy was summed up by Mr. Stern as follows: "Unquestionably this system, sanely and sympathetically handled, means the building of many hundreds of miles of roads that could not otherwise be built, at a saving of many thousands of dollars in the cost of construction."

Missouri has recently joined the list of states that use convicts in road work. For some years she has had laws that authorized this, but has failed to put her prisoners at work which will yield an offset to the state for their expense, and at the same time keep them in good physical condition at tasks which are interesting to most men. Now, however, the State Prison Board and the new State Highway Department have arranged for working as many as 500 of these convicts on the highways. They will be used on the county roads and the counties must pay the state

for their services, food, lodging and guarding, but the total cost is not expected to exceed \$1.50 per convict per day. The work done will be under the general supervision of the State Highway Department, which will thus have an opportunity of studying the conditions which make such labor efficient or inefficient and will be able to develop the best methods for use in Missouri. This is an important matter, because experience shows that the methods by which convicts can be employed to advantage in one section of the country are not necessarily those best adapted for another section. It is very desirable to have the early stages of such work carefully supervised, because in convict labor lies one of the most important means of carrying on road work at this time, when free labor is scarce, and any mistakes in administration and management should be corrected as soon as discovered. Delay in remedying mistakes has been responsible for some of the unsatisfactory results of convict road work in northern states, where conditions were allowed to remain poor until everybody connected with the experiments was discouraged with them.

TABLE NO. 1-B—AMOUNT OF HIGHWAY BUILT DURING 1917.

Including work now under way. Amounts are in miles or square yards—the size of each number indicates which.

State and County.	Warrenite		Bituminous macadam			Water-bound macadam			Gravel			Sand-clay		Earth	
	Am't	Width	Am't	Width	Thick- ness	Am't	Width	Thick- ness	Am't	Width	Thick- ness	Am't	Width	Am't	Width
<b>California:</b>															
Butte .....						20	16&18		15	12&15		10			
Monterey .....			8D	15	6										
San Benito .....									6	14					
San Joaquin .....			25	12					12D	12					
Ventura .....	6	16&20												6	20to24
<b>Connecticut:</b>															
Bloomfield .....						4,000C									
Clinton .....						6	15								
Plymouth .....														100	
Southington .....	5					10		6						125	
Stamford .....						7	18								
West Hartford .....						16,000D	18								
Wethersfield .....			1	16	2										
<b>Florida:</b>															
Alachua .....												9		10	
Broward .....						470,000C	9to30							50	30
Calhoun .....												192C <sup>a</sup>	9to15		
Lee .....												106C <sup>a</sup>	15to24		
Levy .....									2C <sup>b</sup>	10		25C	9	18D	
Osceola .....						C	9	7						11	
Palm Beach .....			60c	15	5	c	3								
St. Lucie .....												20C&D	9	100D	
<b>Georgia:</b>															
Bacon .....												10			
Chattahoochee .....												8C	30		
Liberty .....												25	14to20		
Lowndes .....												125D	30		
Worth .....												72 <sup>d</sup>			
<b>Indiana:</b>															
Clinton .....									11.44	9	12				
Posey .....						7½C	10	10&12	19C	10	8&12				
<b>Iowa:</b>															
Johnson .....														33D	
Webster .....														80C&D	
<b>Kentucky:</b>															
Carter .....						10	16	9							
Greenup .....						2C	14	8				2C	22	40C	22
<b>Louisiana:</b>															
Caddo .....									20	16	8			10	
Catahoula .....														175	
Morehouse .....														93D	
Tangipahoa .....									36	14	4to8				
<b>Maryland:</b>															
Baltimore .....			5	16to30	6	25	16	6	30.051C	10	8				
Charles .....															
Queen Anne's .....						10.65C	12	7						200	24
Talbot .....														100D	24to30
Wicomico .....															
<b>Minnesota:</b>														5C	20to24
Hubbard .....															
<b>Mississippi:</b>															
Forrest .....									6C	12		10C	12	400C	16to30
Chickasaw .....									28C	12	6			58	
Choctaw .....												2		38	20&16
Hancock .....									17.48 <sup>e</sup>	14	8			225	24
Holmes .....									90C	12to14	8	60C			
Itawamba .....									26		4				
Jackson .....									5C <sup>e</sup>	20				2C	16
Jones .....									10	16	9			125	16to24
Leake .....												30C	20		
Madison .....									96C	12		37C	12		
Newton .....									22	8to16		12	18to24		
Oktibbeha .....			25,000C	16	8	61C	12	8							
Pontotoc .....									6C	12	9			90C	
Simpson .....									52	20	8			5	
Sharkey .....															
Tallahatchie .....									10	10	8			500	20
Union .....									28 <sup>r</sup>	15	6				
Winston .....												200	18		



TABLE NO. 1-B—AMOUNT OF HIGHWAY BUILT DURING 1917.

State and County.	Warrenite.			Bituminous macadam.			Water-bound macadam			Gravel			Sand-clay		Earth	
	Am't.	Width.		Am't.	Width.	Thick-ness.	Am't.	Width.	Thick-ness.	Am't.	Width.	Thick-ness.	Am't.	Width.	Am't.	Width.
<b>Missouri:</b>															42.5	24
Monroe .....													800		15	
Ray .....																
<b>New Jersey:</b>							10	14	6	10	20	8				
Burlington .....																
<b>New York:</b>							9½	12								
Yates .....																
<b>Ohio:</b>																
Defiance .....			2	16	7		31	14&16	7	7	12	10				
Gallia .....							2.19C	14	4							
Guernsey .....			2C	16			1.7	10	8						1¼D	26
Madison .....							1.10C	10	8							
Ottawa .....							4.14C	14	8							
							1.16	16	8							
<b>Oklahoma:</b>													7	16	50	32
Jackson .....																
<b>Pennsylvania:</b>																
Allensville .....												9	3to6			
Amity .....															45	
Annin .....															62	
Benton .....															54C	
Butler .....															60	
Ceres .....										1			4		0.5	
Clarion .....															15	
Danville .....										4		4				
Endeavor .....							0.5	14	12							
Findley .....							1	14&16								
Gowen .....							10	16½	6	6	16½	6to12				
Luzerne .....							1								7	
McHenry .....															0.1	
Mountaintop .....																
Muncy .....							5			1.75C	14	8				
New Garden .....																
New London .....			1.7												20	
North Shenango .....							1	12					10	16	12	16
Patton .....							2D						50		2	
Philipsburg .....															150	
Plum Creek .....							22									
Plumstead .....										3D	12	4				
Plymouth .....													9		23	
Salisbury .....							11		4	0.5r						
Sparta .....										0.5r	12					
Upper Unchlan. ....																
Wallace .....							1	14							78	14
Wells .....							3D	24	14							
Willistown .....							1	14							33	
Young .....							3.5	16								
<b>South Carolina:</b>															85C	
Abbeville .....													5D	16		
Cherokee .....										50D		4	100D		350D	
Marlboro .....																
<b>Texas:</b>																
Armstrong .....													33		31	
Brown .....										200	14		25	14	700	
Chambers .....										2C	16				25C	16
Dallas .....										10C	16&18	8			10C	
Dimmit .....													50C		250C	
Deaf Smith .....															200	
El Paso .....										32C&D	14	10				
Frio .....										8			25		75	
Gillespie .....										10D	16		5D	16	20D	16
Gray .....													15	16		
Haskell .....													10D	12	500D	16to32
Jim Wells .....										2	14				15	40
Jones .....													8	12	800	16to32
Liberty .....													200C <sup>b</sup>			
Lipscomb .....															75C	18
Lubbock .....															8C	
Madison .....													5C		14C	
Marion .....													22	26	20	24
Motley .....										2	12	8	15	12	15	12
Rain .....													22C		45C	
San Jacinto .....													90C	30		
Shelby .....													60	20		
Stephens .....													10D	18		
Stonewall .....																
Taylor .....			4.7	16	1					6	16	8				
Val Verde .....							3		8to10							
Vawalla .....															130	24
<b>Virginia:</b>																
Halifax .....															21D	20
<b>Washington:</b>																
Douglas .....							4C	16							20D	
							1D	16								
Kittitas .....							7D	12								
							12C	12								
Pierce .....	3.86C	16					4	16	6	300	16	8			200	14
Snohomish .....										12C						
<b>Wisconsin:</b>																
Trempealeau .....							7C	9	9	4D	9	7			15D&C	24
										9D <sup>1</sup>	9					

<sup>a</sup>—Sand-clay, marl, rock or shell; all under way, but will not be completed this year. About 36¼ miles of shell 8 in. thick and 9 ft. wide. <sup>b</sup>—Pyrites. <sup>c</sup>—Bituminous and water-bound macadam. <sup>d</sup>—Including earth roads. <sup>e</sup>—Shell road. <sup>f</sup>—Slag road. <sup>g</sup>—Cinder road. <sup>h</sup>—Includes earth also. <sup>i</sup>—Shale road.

### BREAKING UP CONCRETE.

There was described in last week's issue a method of breaking up concrete foundations, employed by a contractor in Lansing, which would seem to be applicable to use in removing old pavement foundations and other

slabs of concrete. This method is to drop a heavy iron ball from a height of 20 or 30 ft., the blow being found to shatter the concrete as effectively as by the use of explosives, and probably at less cost and with less danger and interference with other branches of the work. The

ball can be lifted by means of a derrick, or by simply using a pole to the top of which is fastened a pulley, the pole being held in a nearly vertical position by guy-ropes and the ball being raised by hand by a rope run through the pulley.

TABLE NO. 2—COST OF HIGHWAY CONSTRUCTION IN 1917.

State and County or Town.	Total cost per mile or sq. yd.	Cost of grading per mile or sq. yd.	Cost of base per mile or sq. yd.	Cost of shoulders per lin. ft.
<b>BRICK.</b>				
<b>California:</b>				
Santa Clara.....	\$2,155 B&S	\$0.227	\$0.692	\$0.032
<b>Florida:</b>				
Osceola .....	1.85 B	550	....	....
<b>Mississippi:</b>				
Pontotoc .....	22,000 BS	1,250	....	....
<b>Ohio:</b>				
Guernsey .....	26,000 BS	4,500	0.40	0.10
Madison .....	1.25	3,000	.75	.02
Ottawa .....	38,000 BS	2,500	.80	.05
<b>Pennsylvania:</b>				
Luzerne .....	3,000 BS	included	....	....
<b>Texas:</b>				
Hunt .....	10,000 BS	2,000	....	....
<b>Washington:</b>				
Pierce .....	1.79	3,920	0.60	....
<b>CONCRETE.</b>				
<b>California:</b>				
Contra Costa....	\$13,000 to 25,000 B&S	....	11,000 to 15,000	....
Santa Clara.....	0.95 B&S	\$0.227	0.692	\$0.032
Ventura .....	10,050 B&S	....	....	....
<b>Connecticut:</b>				
Clinton .....	2.00 S	....	....	....
<b>Maryland:</b>				
Baltimore .....	135 S & 160 S <sup>a</sup>	....	....	....
Talbot .....	16,000 BS	....	....	....
<b>New Jersey:</b>				
Burlington .....	2.29 S	....	1.30	....
<b>Ohio:</b>				
Defiance .....	13,400 BS	included	....	....
Ottawa .....	15,000 BS	1,200	1.90	.05
<b>Pennsylvania:</b>				
New Wilmington	27,666 BS	....	....	....
<b>Texas:</b>				
Dallas .....	1.40 <sup>b</sup>	....	....	.09
El Paso .....	13,246 BS	....	....	....
<b>Washington:</b>				
Pierce .....	1.00	2,248.80	....	....
Snohomish .....	1.25 BS	....	....	....
<b>BITUMINOUS CONCRETE.</b>				
<b>California:</b>				
Santa Clara.....	\$0.45	....	....	....
<b>Connecticut:</b>				
Plymouth .....	2.30	....	....	....
<b>Florida:</b>				
St. Lucie.....	3,000 BS	....	2,200	....
<b>New Jersey:</b>				
Burlington .....	1.32 S	....	....	....
<b>Pennsylvania:</b>				
Salisbury .....	15,000 S	old grade	old base	....
<b>Washington:</b>				
Pierce .....	.61	.21 <sup>d</sup>	.81	....
<b>BITULITHIC.</b>				
<b>California:</b>				
San Joaquin....	\$0.925 & .075 <sup>c</sup>	....	old base	\$250
<b>Oklahoma:</b>				
Jackson .....	2.04 B	....	....	....
<b>Texas:</b>				
El Paso .....	11,411 BS	....	....	....
<b>Washington:</b>				
Pierce .....	.75	2,000	.60 <sup>d</sup>	....
<b>WARRENITE.</b>				
<b>California:</b>				
Ventura .....	.36	1,120	.60	included in grading
<b>Washington:</b>				
Pierce .....	.70	2,000	.60	....
<b>BITUMINOUS MACADAM.</b>				
<b>California:</b>				
Monterey .....	.34	250	old road	225 per mile
<b>Connecticut:</b>				
Wethersfield ...	.65	....	.70	....
<b>Florida:</b>				
Palm Beach.....	4,000 BS	included	....	....
<b>Maryland:</b>				
Baltimore .....	1.30 S	....	....	....
<b>Mississippi:</b>				
Oktibbeha .....	.80 BS	included	....	....
<b>Ohio:</b>				
Defiance .....	16,000 BS	included	....	....
Guernsey .....	15,000 BS	3,000	.45	.06
<b>Pennsylvania:</b>				
New London....	14,000	....	....	....
<b>Texas:</b>				
Taylor .....	600	already graded	4,500	500

B, Cost includes base. S, Cost includes shoulders.

TABLE NO. 2—COST OF HIGHWAY WORK (Continued.)

State and County or Town.	Total cost per mile or sq. yd.	Cost of grading per mile or sq. yd.	Cost of base per mile or sq. yd.	Cost of shoulders per lin. ft.
<b>WATER-BOUND MACADAM.</b>				
<b>California:</b>				
Butte .....	1,500 BS	200	....	....
<b>Connecticut:</b>				
Clinton .....	1.20 BS	....	....	....
Southington ....	.50	....	....	....
Stamford .....	6,000 BS	1,000	....	....
W. Hartford....	1.05 S	included	....	....
<b>Florida:</b>				
Broward .....	.375 S	0 to \$100	....	....
Levy .....	2,100	4,000	....	included in grading
<b>Indiana:</b>				
Posey .....	5,000 BS	included	....	....
<b>Kentucky:</b>				
Carter .....	10,000 BS	3,800	....	....
Greenup .....	.78 BS	....	....	....
<b>Maryland:</b>				
Baltimore .....	3,000 S	....	....	....
<b>Mississippi:</b>				
Oktibbeha .....	4,100 BS	800	....	....
<b>New York:</b>				
Yates .....	10,000 BS	15,000	4,000	....
<b>Ohio:</b>				
Defiance .....	10,000 BS	included	1,050	2,985
Gallia .....	8,073 BS	....	....	200 per mile
Madison .....	1,835 S	included	....	....
Ottawa .....	5,000 - 8,000 <sup>a</sup>	3,000	....	.06
<b>Pennsylvania:</b>				
Endeavor .....	11,000 BS	included	....	....
Gowen .....	1,000 BS	....	....	....
Patton .....	160 BS	40	....	....
Salisbury .....	228	....	....	....
Wallace .....	4,500 S	....	....	....
Wells .....	8,000 S	....	....	....
Willistown .....	5,000 BS	300	....	....
Young .....	9,000 BS	6,000	....	....
<b>Texas:</b>				
Val Verde.....	2,000 BS	....	....	....
<b>Washington:</b>				
Douglas .....	4,500 S	included	....	....
Kittitas .....	2,500 to 3,800 BS	....	....	....
Pierce .....	.50	2,800	....	....
<b>Wisconsin:</b>				
Trempealeau ..	3,200	550	....	none
<b>GRAVEL.</b>				
<b>California:</b>				
Butte .....	1,000	....	....	....
San Joaquin....	.585	200	....	included in grading
<b>Indiana:</b>				
Clinton .....	2,944 S	....	....	....
Posey .....	3,800 BS	included	....	....
<b>Indiana:</b>				
Caddo .....	8,000 S	included	....	....
Tangipahoa ....	5,500 BS	included	....	....
<b>Maryland:</b>				
Charles .....	4,000 BS	included	....	....
<b>Mississippi:</b>				
Forrest .....	.55 S	1,200	....	....
Chickasaw .....	5,000 BS	included	....	....
Holmes .....	5,000 BS	2,000	....	....
Jones .....	8,000 BS	....	....	....
Madison .....	4,000 BS	included	....	....
Newton .....	5,000	....	....	....
Pontotoc .....	4,000	1,000	none	none
Simpson .....	500	500	....	....
<b>Ohio:</b>				
Defiance .....	4,000 BS	included	....	....
<b>Pennsylvania:</b>				
Amity .....	150 B	....	....	....
Gowen .....	600 BS	....	....	....
<b>Texas:</b>				
Brown .....	2,000 BS	40	....	....
Dallas .....	3,500 S	use old grade	....	....
Jim Wells.....	225 BS	included	....	....
Motley .....	500	250	250	100
Taylor .....	1,000 BS	Use old grade	....	....
<b>Washington:</b>				
Pierce .....	1,850	....	....	....
<b>Wisconsin:</b>				
Trempealeau ...	1,300	350	....	95
<b>SAND-CLAY.</b>				
<b>Florida:</b>				
Levy .....	2,070	500	....	....
St. Lucie.....	2,000 B	....	....	....
<b>Georgia:</b>				
Bacon .....	500 BS	included	....	....
Liberty .....	200 BS	....	....	....
Lowndes .....	600 B	600	....	....
Worth .....	300 BS	....	....	....
<b>Mississippi:</b>				
Chattahoochee ..	1,250 BS	....	....	....
Forrest .....	.40	800	....	....
Holmes .....	1,000	750	....	....
Leake .....	1,500 BS	....	....	....
Madison .....	1,500 BS	included	....	....
Newton .....	1,100 BS	....	....	....
Winston .....	750 BS	....	....	....



(TABLE NO. 2—COST OF HIGHWAY WORK  
(Continued.))

State and County or Town.	Total cost per mile or sq. yd.	Cost of grading per mile or sq. yd.	Cost of base per mile or sq. yd.	Cost of shoulders per lin. ft.
<b>Oklahoma:</b>				
Jackson .....	482 BS	....	....	....
<b>Pennsylvania:</b>				
Salisbury .....	185	....	....	....
<b>S. Carolina:</b>				
Abbeville .....	2,500 BS	1,400	....	....
Cherokee .....	900	....	....	....
<b>Texas:</b>				
Brown .....	400 BS	40	....	....
Gray .....	900 BS	....	....	....
Haskell .....	675	....	....	....
Jones .....	300 B	....	....	....
Madison .....	500	....	....	....
Marion .....	600	....	....	....
Motley .....	400 BS	....	....	....
Rains .....	250 S	....	....	....
San Jacinto .....	1,400 BS	256	....	....
Shelby .....	2,000 BS	1,500	....	....
Stonewall .....	1,000	1,000	....	....
<b>EARTH.</b>				
<b>California:</b>				
Ventura .....	....	13,300	....	....
<b>Florida:</b>				
Calhoun .....	400 S	....	....	....
Lee .....	....	12,000	....	....
Levy .....	395	....	....	....
Osceola .....	....	700	....	....
<b>Iowa:</b>				
Johnson .....	....	3,000	....	....
Webster .....	....	800	....	....
<b>Kentucky:</b>				
Greenup .....	1,800	....	....	....
<b>Louisiana:</b>				
Catahoula .....	90	....	....	....
Morehouse .....	....	40	....	....
<b>Maryland:</b>				
Talbot .....	125	40	....	....
Wicomico .....	50 to 500 S	40 to 400	....	....
<b>Minnesota:</b>				
Hubbard .....	2,000	....	....	....
<b>Mississippi:</b>				
Forrest .....	....	125	....	....
Choctaw .....	800 BS	....	....	....
Hancock .....	450	....	12	....
Jones .....	300 BS	....	....	....
Pontotoc .....	1,000	....	....	....
Tallahatchie .....	50 S	....	....	....
<b>Missouri:</b>				
Monroe .....	....	25	....	....
<b>Ohio:</b>				
Guernsey .....	9,000 S	7,500	....	....
<b>Oklahoma:</b>				
Jackson .....	....	37.50	....	....
<b>Pennsylvania:</b>				
Amity .....	35	....	....	....
Benton .....	32	....	....	....
Clarion .....	150	....	....	....
McHenry .....	50	....	....	....
Salisbury .....	100	....	....	....
<b>South Carolina:</b>				
Abbeville .....	1,750	1,400	....	....
<b>Texas:</b>				
Brown .....	....	40	....	....
Chambers .....	1,000 BS	....	....	....
Deaf Smith .....	....	60 to 200	....	....
Dimmit .....	....	50 to 100	....	....
Gillespie .....	....	250	....	....
Jim Wells .....	....	75 S	....	....
Jones .....	....	60	....	....
Linscomb .....	900 BS	....	....	....
Madison .....	350	150	....	....
Marion .....	350	....	....	....
Motley .....	....	400 S	....	....
Rains .....	100 S	....	....	....
Stephens .....	60	....	....	....
Zavalla .....	....	200 S	....	....
<b>Virginia:</b>				
Halifax .....	1,550 S	850	....	....
<b>Washington:</b>				
Pierce .....	1,156	....	....	....
<b>Wisconsin:</b>				
Trempealeau .....	....	425	....	....

## MISCELLANEOUS.

<b>Florida:</b>				
Lee (sand-clay, marl, rock and shell) .....	20	50 to 1500	50 to 1500	70 to 100
Levy (pyrites) .....	2,000 BS	650	....	....
<b>Pennsylvania:</b>				
New Garden (slag) .....	5,500 BS	700	....	....
Plymouth (cinders) .....	200	....	....	....
Upper Unchlan (slag) .....	1,200 B	....	....	....
<b>Texas:</b>				
Chambers (shell) .....	1,250	150	50	50
<b>Wisconsin:</b>				
Trempealeau (shale) .....	800	400	....	none

<sup>a</sup>, \$1.35 for 15-ft. width, \$1.60 for 42-ft.; <sup>b</sup>, laid on old base; <sup>c</sup>, \$.0925 for 16-ft. road, \$.075 for 24-ft. road; <sup>d</sup>, \$5,000 for 10-ft. width, \$8,000 for 16 ft.

TABLE NO. 3—SURFACE TREATMENT OF ROADS.

State and County or Town.	Kind of oil used.	Area treated this season, miles or sq. yds.	Cost of treatment.
<b>California:</b>			
Butte .....	95% .....	1	....
Contra Costa .....	95% asphalt .....	....	....
Kings .....	California crude road oil .....	....	....
Monterey .....	95% asphalt .....	None	....
San Joaquin .....	Asphalt .....	25	\$500 to \$800
Ventura .....	75% to 85% asphalt .....	....	....
<b>Connecticut:</b>			
Clinton .....	Road oil .....	6	....
East Lynne .....	Asphalt No. 4 .....	10	2,500
East Windsor .....	Tar .....	....	....
Stamford .....	Standard No. 4 & Barrett 70% .....	50	7,500
Wallingford .....	"Dustoline" .....	Dirt roads	....
West Hartford .....	Tarvia B .....	All bit. roads	....
<b>Florida:</b>			
Broward .....	Mexican light oil, 72% asphalt .....	220,000	.02 & .035
Palm Beach .....	U. S. Govt. 38 & 49 .....	95,000	{ single, 5½ to 8c. triple, 13¼c.
St. Lucie .....	Asphalt .....	40	labor 5c, oil 5c
<b>Iowa:</b>			
Johnson .....	Standard No. 4 .....	1	250
<b>Kansas:</b>			
Sedgwick .....	Standard 50% to 60% asphalt .....	1.5	350
<b>Louisiana:</b>			
Caddo .....	R. R. Office O-49 specifications .....	....	....
<b>Maryland:</b>			
Baltimore .....	Tarvia, Uglite, Aztec, Standard Oil .....	75	7c to 9c per gal.
Queen Anne's .....	Tar .....	None	....
Talbot .....	Uglite B, Tarvia A & B .....	114,800	15c per sq. yd.
Wicomico .....	Tarvia & Uglite .....	....	....
<b>New Jersey:</b>			
Burlington .....	Asphaltic .....	40	16c. per sq. yd.
<b>New York:</b>			
Yates .....	Bit. A .....	10	500
<b>Ohio:</b>			
Ottawa .....	H. T. ....	4	2,200
<b>Pennsylvania:</b>			
Coburn .....	Atlantic Refining road oil .....	0.2	....
Hickory .....	Tarvia .....	5	2,000
Jeffersonville .....	Light road oil .....	15	....
Plymouth .....	Atlantic Ref. road oil, Tarvia B .....	6	....
<b>Texas:</b>			
Dallas .....	50% asphalt for gravel, 80% asph. for macadam .....	8	600
Liberty .....	Crude petroleum .....	6	200
Taylor .....	85% Texaco .....	4.7	....
<b>Washington:</b>			
Pierce .....	Fuel oil .....	6	95
<b>Wisconsin:</b>			
Trempealeau .....	Tarvia B & Standard No. 5 .....	30	3¼c. per sq. yd.

## MAKING AUTOS PAY FOR ROAD SYSTEM.

Building a system of highways entirely by money raised by license fees paid by owners of automobiles is a project on which the voters of Illinois will be asked to state their opinion at the November elections. The proposition is to issue bonds at the rate of ten million dollars a year, beginning in 1920 and continuing for six years, the bonds to be paid off by the automobile fees collected. To make this possible, it is proposed that the present fees for gasoline autos of \$3 for 10 horsepower or less ranging up to \$10 for 50 horsepower be increased next year to a minimum of \$4.50 and a maximum of \$20, and in 1920 to \$6 and \$25, and the motorcycle fees from \$2 to \$3 in 1918 and \$4 in 1920. The fees for electric vehicles would be increased from \$5 to \$12 for those under 2 tons capacity, and from \$10 to \$25 for those of over 2 tons. The project of road building planned includes about four thousand miles of hard-surface roads.

## The WEEK'S NEWS

State Highway Developments in Pennsylvania, Kansas and Wyoming—Typhoid in New York City and Joliet—New Water Rates in California Cities—Los Angeles Municipal Electric Plant Wins Litigation—Kansas City, Mo., Policemen Dismissed—Fire Prevention in Los Angeles—Coal Gas for Auto Fuel in England—State Control of County Finances in California—Open New York Subway Section—Car Strikes in San Francisco and Monroe, La.—Developing the Port of New York.

### ROADS AND PAVEMENTS

#### State Road Aid in Pennsylvania.

Harrisburg, Pa.—During the next two years \$1,873,470.40 will be distributed to the second-class townships of the state, this sum representing the state's share of the cash road tax bonus. During 1917, \$929,325.20 will be distributed, of which sum \$727,375.34 covers the bonus of 1910 and \$201,959.86 for 1912. The 1911 bonus amounts to \$944,135.20, which will be distributed to the townships during 1918, as the law does not permit the distribution of the entire appropriation during any one year. After all disbursements of the township cash road tax bonus fund as provided by the 1917 legislature, shall have been made, there still will remain unpaid the bonus for the years 1913 and 1914. Future legislatures must provide for the payment of this amount. Because the deficit was increasing so rapidly, the 1915 legislature suspended the bonus feature until such time as all back amounts were paid in full to the townships. The law requires that townships must file reports with the Bureau of Township Highways, of the State Highway Department, before they may receive this bonus. The state bonus money must be spent for one or more of the following purposes: Buying and installing concrete, cast iron, or corrugated pipe and installing concrete or stone masonry head walls; for the construction of concrete culverts and of concrete or of steel bridges, according to plans approved by the Bureau of Township Highways; for permanent grading, widening, or straightening roads; for the construction of brick, concrete, macadam, slag, gravel, or flint roads; for the construction of concrete, or concrete and stone retaining walls to support roads and the townships' share of the cost of state-aid road construction.

#### Cost of Good Roads in Kansas.

Topeka, Kans.—The Kansas Good Roads association has figured out some tables and other data relative to the improvement of roads in Kansas, and has set out to boost the 5,000 miles in five years improvement campaign. In order to improve a road, the law requires petitions from 35 per cent of land and 52 per cent owners, or 51 per cent of land and 35 per cent owners, or 60 per cent of land in district. Ponds are to run 10 or 20 years, and not over 5 per cent interest. The cost is divided, county 50 per cent; township, 25 per cent; and the property in the district, 25 per cent. Of course that is figured after the federal aid and road donations from any sources has been counted off. Railroads in district are subject to a special tax. Railroads and third class towns are subject to township tax. In average county, towns and railroads pay one-half of tax. According to the figures of the association, the various kinds of roads figure out on a basis of cost per acre as follows: Roads (gravel, sand, clay, or oil), to cost \$1,000 per mile; average cost per acre, 10c; 1 cent per acre per year for 10 years. Roads (gravel, sand, clay or oil), that cost \$2,000 per mile; average cost per acre, 20c; 2 cents per acre per year for 10 years. Roads (Taravia or asphalt macadam), that cost \$6,000 per mile, average cost per acre, 55 cents; 6 cents per acre per year for 10 years. Roads (concrete), that cost \$12,000 per mile; average cost per acre \$1.13; 12 cents per acre per year for 10 years. Roads (concrete), that cost \$14,000 per mile; average cost per acre, \$1.36; 14 cents per acre per year for 10 years. Roads (brick or concrete), that cost \$16,000 per mile; average cost per year per acre, \$1.56; 16 cents per

acre per year for 10 years, 8 cents per acre for 20 years. Roads (brick), that cost \$18,000 per mile; average cost per acre, \$1.76; 18 cents per acre per year for 10 years; 9 cents per acre per year for 20 years. Roads (brick), that cost \$20,000 per mile; average cost per acre \$1.95; 20 cents per acre per year for 10 years; 10 cents per acre per year for 20 years.

#### State Highway Plans in Wyoming.

Cheyenne, Wyo.—State highway engineer Z. E. Severson has issued a statement regarding the work of the state highway commission which follows in part: "Until the last session of the legislature Wyoming was one of the six states that did not have a state highway department. This condition and the realization that real progress would never be made in the construction of good roads, together with the fact that aid could not be secured under the federal aid road act until a state highway department was organized, brought about the passage of the state highway act. The state highway act divided the state into five districts and created a state highway commission composed of a member, appointed by the governor, from each of the districts. The matter of districts has no other significance except to define the residence of the members of the commission. The state highway commission as appointed by Governor Kendrick consists of M. R. Johnston of Wheatland, Joe C. Kinney of Cokeville, Robert D. Carey of Careyhurst, F. E. Williams of Sheridan, and Gus Holmes of Cody. A system of state highways has been designated, including Lincoln highway, the Yellowstone highway, the Black and Yellow trail, and the more important of those roads on which federal aid may be secured. Other highways may be added to this system from time to time as their importance seems to warrant and the state develops. As the legislature in creating a state highway fund provided for only a one-quarter mill levy, which in 1917 will produce about \$60,000, the money actually available for construction is very limited. This makes it necessary for the counties to provide the funds with which to meet the federal aid on a dollar for dollar basis. In view of the late date at which the department was organized, the spirit of cooperation on the part of the counties has been very gratifying, only one county having chosen to refuse to respond in any way up to July 1 the applications from the various counties for aid amounted to approximately \$90,000, meaning that an equivalent amount had been appropriated by these counties. Before any construction work could be undertaken it was necessary that complete surveys be made in some counties there are no road records of any value. Surveys have now been completed for the Casper-Salt Creek road in Natrona county and for the Medicine Bow-Marshall road in Albany county and are in progress on nine other projects in various parts of the state, there being at the present time ten complete surveying parties in the field for the state highway department. It is expected to have the surveys either completed or under way, by August 1st, on at last thirteen different highway projects. Applications for federal aid on eight projects have been filed with the secretary of agriculture, and construction on these roads will necessarily have to wait until action has been taken by the federal officials. Careful investigation is developing the fact that a large percentage of our highways will need a surfacing of gravel or some better material if they carry the traffic that may be reasonably expected. The rapid increase in the use of the motor truck is doing more than anything else to limit the use of



the ordinary earth road, as well as the continued practice of hauling heavy loads on narrow tire wagons. Our next legislature should provide a statute limiting the wheel loads in proportion to the width of the tire. Owing to the fact that the federal aid road act provides that federal funds must be spent on post roads or roads that may hereafter be used as post roads, the Lincoln highway and the Yellowstone highway are eliminated from aid under this act except for very short sections. Both of these roads parallel railroads for the greater portion of their lengths and there is very little probability that they will ever become post roads. A larger state highway fund would permit the department to cooperate with all the counties through which these two highways pass in the construction of improved roads. Both of these roads are on feasible routes as through east and west, and north and south highways, and prove of great value to the people of Wyoming, as well as to a large and ever increasing tourist traffic. The total amount apportioned to Wyoming for the five year period covered by the federal aid road act is \$916,900, and of this amount there was available on the first of July \$183,951.

In order for this state to secure the full amount it will be necessary for each county to appropriate every dollar for construction that is not actually needed in maintenance. By maintenance is meant efficient work that secures a dollar's worth of work for a dollar expended, and not the wasteful squandering of funds under the road supervisors. Fortunately a number of the counties have come to see the almost criminal extravagance of maintaining road supervisors and have ignored them entirely, and it is to be sincerely desired that the counties will follow in this reform and virtually abolish a useless political job. This is all the more important at this time when the cost of labor and materials is rising so rapidly that every dollar spent should secure adequate return. One of the duties imposed upon the state highway engineer is that of preparing standard plans and specifications for all bridge work in any county, city or town where the span exceeds five feet or the cost exceeds two hundred dollars. This is a very wise provision, because it insures the construction of bridges which are properly designed for the loads which they must carry and prevents bridge companies and others from furnishing plans and bridges which are altogether too light and are designed mostly for selling purposes. Standard plans and specifications are now available for various types of structures, for any county, city or town in the state that may require them.

Highway improvement in Wyoming may be brought about most rapidly by larger appropriations on the part of the counties in order to secure federal aid and decreased expenditures for patch work. Over \$500,000 was spent by the twenty-one counties of the state last year on roads and yet the mileage of improved roads secured for this expenditure was almost negligible. It is safe to say that each county can appropriate at least sixty per cent of its road fund toward new construction and when this is done rapid progress will be made."

#### Old Philadelphia Street Lengthened.

Philadelphia, Pa.—With the completion of work in progress Broad street, considered the finest of Philadelphia's thoroughfares, will stretch in a straight, paved line, 214 feet wide, from League Island on the south to city line on the north, a distance of eleven and three-quarter miles, claimed to make one of the longest paved streets of that width in the world. Incidentally, the perils to automobilists in "Dead Man's Curve" on York road will disappear. The grading is nearly finished, but the paving will not be completed until next year. Cutting the street through between Olney avenue and Elbow lane has been a tedious job. Several houses had to be torn down and several others moved aside to make it possible. When Broad street stretches its full length, the paving alone will represent an outlay of \$1,500,000. The curbing will be the equivalent of \$305,000. The lights and conduits are estimated to be worth \$1,000,000. Broad street is almost as old as Philadelphia. According to the city historians, it was laid out by surveyor Holmes about 1690

along with Market street, with Centre Square, now Penn Square, as the intersection. They were to be the two wide streets of the town, and so they have remained until this day.

## SEWERAGE AND SANITATION

### Sewer Construction Not Emergency Work.

Milwaukee, Wis.—Judge Belden, of Racine, has upheld the eight hour ordinance for municipal contracts recently passed by the Milwaukee common council. The ordinance was contested on contract work for the Milwaukee sewerage commission, and in his decision judge Belden holds that an ordinance limiting the hours of work for municipal contracts can be passed by the common council, and that the sewerage commission, as a municipal department, is not immune to its provisions. It is also held that the work of excavating sewers under ordinary conditions is not such as can be considered an emergency exception. The case was a test one brought to try the constitutionality of the law and a contractor in the sewerage work was arrested on a charge of having violated the ordinance by working his laborers for a longer period than eight hours. The decision provides that this was a violation of the law. The decision upholds the right of the common council to make limitations for municipal contracts. Action was brought against the Wisconsin Tunnel Construction company. The case may be appealed to the supreme court.

### Typhoid Cases Traced to Milk.

New York, N. Y.—A number of new cases and new suspected cases of typhoid fever were reported to Dr. Edgar Wisely, head of the Richmond health board, by special physicians appointed to follow the West New Brighton route of a milk dealer who had been buying contaminated milk from a farmer in Delaware, N. J. Thirty-five cases of typhoid are now being treated in the hospitals, while about forty suspected cases are under observation in Staten Island, where the outbreak is located. "The situation is not alarming, but it is serious enough to cause some anxiety," said Dr. Haven Emerson, health commissioner. "Under normal conditions Richmond would have about forty cases a year, and as long as that normal stage is maintained we pay no more than ordinary attention to it, but when this number of cases is reported in a few days we take quick steps to warn the public that the sanitary regulations must be observed strictly and the utmost care in the selection of food and milk must be taken." The New Jersey State Board of Health offered its aid in finding the source of contamination of the milk supply, and experts have carried the search to Delaware, N. J. It was found that one New Jersey dealer had served about 800 families, although his milk reached more than 2,000 persons because of the size of the families and because he sold to two ice cream dealers and one bakery. In one family seven cases are under observation. Most of the cases have been reported from one of the best residential districts of West New Brighton. The Richmond Board of Health is insisting upon giving all persons the anti-typhoid vaccine and upon sending special nurses and physicians to study all suspected cases. Special sanitary officers and physicians, as well as nurses, are at work in the district where the cases were found, and the Richmond Medical Association is co-operating. Officials of the State Board of Health have also offered their assistance.

### Typhoid Found Not Due to City Water.

Joliet, Ill.—City water was given a clean bill of health following a visit of Dr. C. E. Crawford to the city to investigate eleven cases of typhoid fever recently under quarantine. Blame for the present epidemic has been placed unreservedly upon private wells which have become contaminated by surface water. Dr. Crawford, examiner for the State Board of Health, was summoned here by health commissioner Higgins because of the belief which had been expressed on the part of some Joliet physicians that mild cases of the disease which had appeared were malaria rather than typhoid fever. All of those ill were visited

and without exception Dr. Crawford confirmed the diagnoses which had been made, pronouncing the cases typhoid fever. The eleven cases are blamed on drinking water which had been contaminated by surface drainage. Five cases have been traced to the use of water from a so-called spring which was really seepage from rocks, children of the neighborhood being deceived by the fact that the water had been cooled by its passage through the rocks and drinking it while at play. The health department was able to prevent the use of this water after the appearance of the first typhoid cases only after stationing an officer on the premises and warning those who came to it. Two cases were traced to swimming in the DuPage river. All of the other cases were traced to the use of water from private wells. In only one family in which there is a case of the disease is there city water connection. However, it has been ascertained that the child who is ill had been in the habit of drinking water from a neighbor's well, and this is blamed for illness which has resulted. Health commissioner Higgins warned Joliet people to avoid water from private wells. As a result of the investigation of health commissioner Higgins and Dr. Crawford, the milk men of the city were absolved from all suspicion of having spread the disease in the city. In no two of the cases have the same milkmen been supplying the families. Dr. Crawford approved the city ordinance which authorizes the destruction of all milk bottles in homes in which the disease appears. The ordinance is declared to be stronger than the ruling of the state health department, which states that bottles from a home in which there is typhoid fever may be returned to a dealer after they have been thoroughly sterilized under the direction of the health department.

#### Nutrition Clinics Opened.

New York, N. Y.—Following the lead of Dr. William P. Emerson, of Boston, through whose efforts there was established at the Massachusetts General Hospital a special clinic devoted to the cases of defective nutrition, there have been established in this city five special nutrition clinics. These clinics were established mainly as the result of a co-operative investigation carried on by the Bureau of Child Hygiene of the Department of Health and the New York Association for Improving the Condition of the Poor. The clinics are intended mainly for the treatment and supervision of the large number of school children who show marked evidence of defective nutrition. A large part of the work of these clinics will naturally be educational, and instruction of the mothers in proper feeding of the family will play an important role. It is probable that classes of instruction modeled on the tuberculosis classes which have proved so successful in the anti-tuberculosis campaign will be organized as part of the work. One of the clinics will treat only children from one to six years old on one day of the week.

### WATER SUPPLY

#### Commission Fixes Rates.

San Francisco, Cal.—The State Railroad Commission has established rates to be charged for domestic water in Placer county by the Pacific Gas and Electric Company. Different charges are established for Auburn, Rocklin and Colfax; for Newcastle and Loomis; for wholesale to the town of Lincoln, which has its own municipal system; to the Roseville Water Company, which sells water in Roseville, and to the Southern Pacific Company at various points along its line. The commission specifies the new rates are to be for "pure, clear, fresh water," and that they shall not go into effect until the commission certifies in a supplemental order that this quality of water is being supplied. Monthly flat rates of \$1.25 for residences, apartments, etc., of five rooms and less are fixed; fifteen cents for each additional room, twenty-five cents additional for each bath tub, etc. Sprinkling is set at three cents per hundred square feet of lawn, garden, etc., when taken continuously, and seven cents otherwise. From \$2 up is the rate fixed for shops. Monthly meter rates were fixed with a minimum of \$1.00, at twenty

cents per hundred cubic feet, for the first 1,000, ten cents per hundred for the next 4,000, four cents for the next 5,000, and two cents per hundred for all over 10,000. For the town of Lincoln and the Roseville Water Company rates are established at sixteen cents a miner's inch per twenty-four hours. The Pacific Company and its predecessors have been selling water for domestic and irrigation use in Placer county for many years, and supplies practically all the water in that county. The commission held a number of hearings upon the question of the rates of the company in the territory mentioned, and it was shown that the company had no consistent schedule.

#### Survey Report on Water Rates.

Springfield, Ill.—The survey of the Sage Foundation finds that the local water rates "make a very favorable showing" compared to rates in other cities. The report says that comparisons are complicated "since a number of different methods were being used in fixing rates, and comparisons between Springfield rates and rates charged elsewhere were therefore not particularly significant. Moreover the fairness of a rate must take in account the source of the water supply, size and ownership of the plant, the quality and treatment of the water, the manner of its distribution, and numerous other conditions—considerations which are not taken into account in a mere comparison of rates."

According to authorities quoted in the report, "data from 640 American cities showed the average of the highest rates per 1,000 U. S. gallons was 27 cents; and the average of the lowest 11 cents." The surveyors found that the "highest rate charged for commercial or domestic uses of water in Springfield was 14 cents per 1,000 gallons, while the lowest rate was six cents per 1,000 gallons. Recent figures show the local rates slightly above the earlier figures, but they still are much below the average of the 640 cities. The more recent figures for the highest Springfield rates are 16.2-3 cents per 1,000 gallons for both domestic and commercial uses, and where the rate is lowest 6.2-3 cents per 1,000 gallons for commercial uses and 11 cents for domestic uses. Thus at only one place is the Springfield figure as high as the average of 640 American cities; and in that case the equality of rates is at one of the least important points; for the eleven cent charge applies only in cases where 105,000 gallons of water are used for domestic purposes each quarter year—an amount reached by only a few consumers. Thus the comparison shows the Springfield rates well within the bounds of general practice." The report says that "it is cheaper to pay a private individual or company a substantial profit than to lose a greater amount through public inefficiency. Springfield's experience in public ownership of the water supply would invalidate this line of reasoning, since the local water system and its management compared favorably with similar enterprises privately owned." The survey examination of the local water works confirmed the conclusions of the Illinois State Water survey. The latter said regarding water rates: "The general indication of these figures is that the city of Springfield has secured a water supply at comparatively low cost for installation, and that the unit costs are moderate and are being gradually reduced year by year." The uniform system of accounting and cost data required by the State Utilities commission for privately-owned water works was voluntarily installed by this publicly-owned plant in Springfield.

While the rates charged are reasonably low, a few difficulties relating to details still remain to be equitably adjusted. One relates to the methods of scheduling the rates. Although the instances are rare, they are significant in indicating certain inconsistencies in the rate schedule. One method of obviating this difficulty, which is gaining considerable acceptance, is to charge a fixed sum of money determined according to the size of the meter and according to a certain maximum quantity of water allowed to be used in the year. For example, where a five-eighths-inch meter is used the payment of, say, five dollars would secure a maximum of 25,000 gallons of water per year; \$10 (a three-fourth-inch meter being used) would secure an annual maximum of 50,000 gallons—the average amount used annually in domestic service; and on up the scale. All water furnished in excess of the maximum allowed for each different meter size would be charged for at the rate of, say, fifteen cents per 1,000 gallons. The rates themselves would need to be computed, of course, after a careful study of the cost of supplying the water and the local method of distributing this cost among consumers.



Another method is to charge a certain fixed amount for each connection with the water system, the amount depending on the size of the meter; and then to charge a uniform rate for all water furnished. For example, the fixed charge of a five-eighth-inch meter connection might be twenty-five cents per month; for a three fourths-inch meter, 40 cents; for an inch-meter, 65 cents, etc. And in addition a straight charge of, say, ten cents per 1,000 gallons would be charged for all water used. It might be desirable, instead of making one rate for all water used in the latter case, to charge two or three rates graduated according to the amounts consumed. One rate is theoretically correct, but at times there appear to be special reasons for varying from it. Again, as in the other method, the exact rates could and should be computed from the very excellent cost data in the hands of the water department and from an operation statement similar to the one now made up by the department.

There is a certain "overhead" and operation cost: that is, the cost of furnishing service, reading meters, etc., which is in addition to the cost of securing and pumping water. This cost should be borne to a large degree, if not entirely, by the flat meter charge suggested in the second method. After that is taken care of there is no good reason why all persons should not pay at the same fixed rate for the water they actually use. This principle is the foundation of all regulation of rates, and any substantial deviation from it savors of rebating and is particularly obnoxious in municipally-owned utilities.

The general conclusions of the surveyors is that the water department as a whole was being very efficiently managed. Attention is called to progress made since the original investigation by the survey agents. "Several recommendations as to details in which the office work of the water department could be improved were made in the earlier drafts of this report. Most of these have received action. One related to the unit of measurement used as a basis for making water rates. Formerly the rates were based upon a certain charge per thousand gallons, although all the meters measured by the cubic foot. This not only made it difficult for most persons to check their water bill against the meter charge, but it entailed a great deal of extra work in the water department and caused some errors. There appeared to be no reason why rates should not be made on the cubic-foot basis and it was so recommended; the change in this basis has since been made."

#### Waterworks Profits Lower Tax Rates.

Orange, N. J.—Though the Orange city commission was notified of a prospective excess of expenditures over receipts this year in the water department, it voted to transfer \$25,000 of an accumulated surplus in that department to the general city fund, with the result that the tax rate will be reduced twelve points, from an estimated \$2.52 to \$2.40. Last year's rate was \$2.37. The department's annual earnings are about \$30,000 and the plan may be adopted as a regular policy. The action will leave a balance of about \$12,000 in the fund, aside from over \$50,000 loaned the city at two per cent. As the tax budget stood, the amount to be raised by taxation was \$410,935.26, and the reduction will bring it to \$385,935.26. Director of public utilities Wethling states that the department could afford to have its surplus reduced this year and that as the people had paid for the water system they had a right to benefit by any funds it might return above expenses, instead of having the commission loan it to the city at two per cent. There is need for the tax reduction this year, he said. Commissioner William A. Calhoun, director of finance, objected on the ground that financial conditions in the country generally make it advisable to leave the surplus intact as a fund from which the city could borrow on notes, as it may have difficulty in borrowing in anticipation of taxes.

## STREET LIGHTING AND POWER

#### Rate Increase Denied.

Flemington, N. J.—Permission to increase the cost of its gas from \$1.40 per 1,000 cubic feet to \$1.90 has been denied by the state board of public utility commissioners to the New Jersey Northern Gas company, consolidated of the Flemington and Lambertville Gas Light companies. In addition to its other territory this firm also serves the boroughs of Pennington and Hopewell. The board states that from the testimony submitted it seems evident that if the high cost of gas manufacture continued additional revenues would be needed, but that the testimony failed to indicate how much additional revenue would probably result from the new tariff. In the new schedule the com-

pany proposed a fixed or service charge of 50 cents for each customer each month in addition to \$1.40 per 1,000 cubic feet of gas consumed. The board comments that there was no satisfactory proof that the service charge bears a proper relation to the cost of readiness to serve. The company, in its application, stated that the rates in the territory supplied by it had been reduced at the time the company was formed by consolidation and that a further reduction had been made on January 1, 1916, providing for a net rate of \$1.50 per thousand cubic feet. The rate at present charged is \$1.60 per 1,000 cubic feet, with 10 cents reduction for prompt payment and the proposed rate was \$1.40 a thousand, with a fixed charge of fifty cents a month additional. Because of its inability to conclude that the tariff would be fair and reasonable to all classes of consumers sanction for any alteration was withheld. In its application the firm maintained that the cost of manufacture is 30 cents, net, higher per 1,000 cubic feet than it was in 1916. Last year, it held, the net cost was 84.9 cents per 1,000 cubic feet of gas sold, and during the first five months of this year it advanced to \$1.149 without taking into account interest on bonds or dividends on stock. The borough clerk of Pennington and the Housewives' League of Flemington protested against any change in the price of the product.

#### City Wins Power Competition Case.

Los Angeles, Cal.—The validity of the temporary operating power contract between the city of Los Angeles and the Southern California Edison Company, under which the city is receiving \$2,000 a day or more from the distribution of aqueduct power, has been sustained by superior judge Shenk. The city wins an important victory over the Los Angeles Gas and Electric corporation by this decision. It was this corporation which sought to have the courts declare the operating contract, under which the company distributes the city's power, and the city sells the surplus aqueduct power over its own needs to the corporations, invalidated. The suit was one of the long series precipitated by the Los Angeles Gas and Electric corporation to hamper the city in developing and distributing its aqueduct power, and the decision of judge Shenk, sustaining the legality of the contract, in almost the same manner that the state railroad commission sustained it, was hailed with gratification by the public service commission and its attorneys. W. B. Mathews and W. B. Himrod, who represented the city in the litigation, assert that unless the case is appealed by the gas corporation, the city can go ahead unhampered under judge Shenk's opinion. The gas corporation, city officials say, is seeking to prevent the city from using the revenues of the power to pay interest and sinking fund charges on the power bonds. It is said that the company will appeal the case.

#### War Conditions in English Municipal Plants.

Leeds, England.—The report of the Leeds corporation electricity committee for the year ended March 31, 1917, states that "the number of units sold for all purposes was 54,992,742, an increase of 22½ per cent. For power purposes the sales of energy had increased rapidly, owing to war requirements, the number of units sold having advanced by 46.6 per cent. The police lighting regulations and daylight saving during the summer of 1916 caused the sales of energy to private lighting consumers to remain practically stationary, while the sales for street lighting had practically disappeared, being only £352 (\$1,713), as compared with £1,188 (\$5,781) in the previous year, and £2,530 (\$17,179) in the last pre-war year. The sales of energy to the tramways department showed a further decrease of 29.6 per cent, representing the extended use of the separate tramways generating station. It is pointed out that the war prices of materials and labor caused the working expenses to increase in greater ratio than the income. The profit for the year was £17,286 (\$84,122), an increase of £196 (\$954), as against the year before. Out of this sum £13,125 (\$63,873) had been contributed to the cost of permanent works, leaving the surplus profit at £4,161 (\$20,250), which has been transferred to the reserve fund."

## FIRE AND POLICE

### All Firemen Now Regulars.

San Jose, Cal.—City manager Reed announces that the fire department is now composed entirely of "full-time" men, being at last free from the old conditions which kept a dozen men subject only to emergency call. The change was made complete with the dropping of the last two "call" men on the list and the appointment of two regular firemen to take their places. Under the old system, says Reed, the efficiency of the department was greatly hindered, as no special dependence could be placed on employees of this sort, since they could not be gotten in every case when an emergency arose. The "call" men were used particularly for night alarms. Reed says that there were fifteen of these men when he first took office, and that on last December ten were replaced by as many regulars through action taken by the city council.

### Policemen Dismissed After Car Strike.

Kansas City, Mo.—The board of police commissioners has discharged forty-one patrolmen and two police sergeants, who during the recent strike of the employees of the Kansas City Railways declared that they would not give protection to the imported strikebreakers. Many of these were policemen from the station near the carhouse, where there was a great deal of rioting. When the cases of the policemen charged with insubordination came up, all the men reiterated their positions that they would not ride on cars to protect imported strikebreakers. Business men urged that the men be discharged in the interests of discipline. Several local labor unions united in an alleged threat to cause a strike of 12,000 workmen if the policemen were discharged. The business agent of the Industrial Council and the president of the Business Trades Council sent a telegram to the lieutenant governor asking that the discharge be prevented. The police board is appointed by the governor, and is independent of local control. There was no difficulty following the discharge of the policemen.

### Fire Prevention Work Helps Reduce Losses.

Los Angeles, Cal.—Losses by fire on buildings in Los Angeles and on their contents were reduced radically through the working of the fire prevention bureau, according to the report on the work of the bureau by Archie J. Eley, fire chief. The reduction in the loss by fire on the contents of buildings was approximately \$200,000, and the loss on buildings was cut more than \$35,000 through the rigid inspection and the careful enforcement of fire prevention precautions by the bureau. The total number of inspections made was 39,120. The showing made by the fire prevention bureau in the eleven months in which it has been in operation up to the beginning of the new fiscal year was received with much satisfaction by the fire commission. Increase of the bureau and extension of its activities are planned during the present fiscal year. The fire loss on buildings during the eleven months' operation of the bureau up to July 1 was \$239,324, and the loss on contents was \$445,696. During the previous year the loss on buildings was \$275,705, and the loss on contents was \$630,003.

### Boys Organize for Fire Prevention.

New York, N. Y.—Boys in the congested Brownsville section of Brooklyn have come forward with a new plan for co-operation with the city in preventing fires. Three boys have organized a junior fire brigade consisting of twenty-five members, each of whom signs a pledge "to prevent fires, to help educate the people to prevent fires, and to do my duty at all times." The boys will call the attention of their neighbors to common fire hazards, attempt with the utmost persistence to have these hazards eliminated, distribute fire prevention literature where it will be of real value, and possibly arrange for meetings on fire prevention in their schools. Fire commissioner Robert Adams has sent the boys the following letter: "I am in thorough sympathy with your plan for the organization of a junior fire brigade and I think the idea is an excellent one. Your

pledge to prevent fires, to help educate the people to prevent fires, and to do your duty at all times, seems to me to cover the objects of your organization very well; and your badge will add distinction to your membership. The fire department will be glad to co-operate with you in the distribution of such fire protection material as we have, in arranging meetings on fire prevention provided you can secure sufficiently large attendance, and in hearing reports from you and your co-workers on fire prevention conditions in your district. I trust that you will be the pioneers in organizing the younger element in the city for the work of preventing fires."

## MOTOR VEHICLES

### New Auto Apparatus Installed.

Owosso, Mich.—The city commission recently installed two pieces of motor fire apparatus in the central station. It purchased a Duplex combination hose and chemical truck and has leased a hook and ladder truck, also from the same manufacturers. The city will pay \$55 per month for the hook and ladder until spring, when if it wishes, it can purchase the outfit at \$4,000, the money paid in rent, to apply on the purchase price.

### Auto Fire Apparatus Service.

Emporia, Kans.—The Emporia fire department's new motor truck has been recently installed after a try-out by Charles Stinson, chief of the local fire department. The new truck was built over a White chassis by the Anderson company in Kansas City. The truck is propelled by a 6-cylinder engine, rated at 60-horse power, but capable of developing 78-horse power. The machine's motor is equipped with an electric starter as well as with an auxiliary crank. The rear wheels are 36x5 and have solid rubber tires. The truck itself weighs about 5,000 pounds. The truck contains many features suggested by chief Stinson and the Emporia city commissioners. It has a carrying capacity of 1,200 feet of hose. It carries four chemical extinguishers, two 24-foot ladders and a full assortment of auxiliary tools. It is capable of a speed of fifty miles an hour. Six men can be carried. The truck cost the city about \$4,500.

### Coal Gas Fuel for Motor Vehicles in English Cities.

London, England.—With the price of gasoline at 61 cents per gallon, retail, numerous substitutes for furnishing vehicular motive power have appeared on the market. A development in the use of coal gas for automobiles has passed the experimental stage, a motor bus using coal gas having made the journey from London to Eastbourne and return, a total distance of 130 miles. The Grimsby municipality, which operates a system of motor driven omnibuses to outlying districts, is said, after a trial extending over four months, to have effected a reduction in fuel cost per mile from 4.30d. to 1.66d., the price of gasoline being 61 cents per gallon, and gas 61 cents per 1,000 feet. The only change made in the motor is the fitting of a butterfly valve in the air-intake pipe for the regulation of the air supply, which allows the engine to draw the gas in the correct quantity according to load and speed. It is claimed that an advantage accruing from the use of gas is that the engine is cleaner and the valves do not require grinding so often. In Yorkshire the use of coal gas for automobiles appears to be increasing rapidly. Recently Harrogate adopted it, and now Halifax and Todmorden have decided to give it a trial. The necessary apparatus is relatively cheap and easily adjusted, consisting of a canvas bag with an inner layer of rubber, shaped like a mattress, which holds the gas drawn from the main, and is strapped to the top of the motor omnibus or to the rear of the automobile. The gas in the bag is connected with the induction pipe, and the engine is worked by the suction press in the same manner as the ordinary gasoline vapor induction. The principal disadvantage to the use of coal gas for automobiles is the bulky container necessary for the gas. The use of gas for small cars has proved unsatisfactory by reason of the problem of adequate space for storage. A suitable cylinder



for containing compressed gas is said to be necessary for the general usage of such fuel for motor cars, and the probability of the continued utilization of coal gas as a substitute for gasoline appears to depend upon facilities for storage or compression.

## GOVERNMENT AND FINANCE

### Mayor for Twenty-Five Years.

Danville, Va.—Captain Harry Wooding is perhaps the first Virginia mayor to have the distinction of serving his townspeople for a quarter of a century without interruption. When mayor Wooding first assumed the reins of government in 1892, Danville was a small border town, with saloons on nearly every corner. There were mule street cars, which gave service in part of the city only, and North Danville, now part of the city of Danville, was a separate community, known as Neapolis. Mayor Wooding has watched the town develop along every line, and he has seen it almost double in size.

### New Charter Adopted.

Xenia, O.—This city has adopted the charter proposed under the new commission form of government by nearly a 4-to-1 majority. The result of the election was 795 to 211 against.

### Mayor Cleared of Bribery Charge.

Ottumwa, Ia.—Pat Leeny retains his office as mayor of this city. The proceedings to oust him have failed, judge M. E. Hutchinson, of Lake City, deciding that charges made against the mayor had not been sustained. The charge against Leeny was that he had offered \$1,500 to influence the other commissioners to vote for a paving contract, saying he would get \$3,000 if the company got the business. The testimony was not corroborated, according to the judge. As no other charges, involving the conduct of the mayor in connection with enforcement of the law, the court did not find a preponderance of evidence against the mayor, but said he would not give him a certificate of character.

### Fire Insurance on Municipal Property.

Columbus, O.—In the period from January 1, 1907, to August 20, 1917, the city of Columbus expended \$35,670.84 in fire insurance premiums on its many properties. In the same time, only \$218.20 has been realized in recoveries. Those figures are indicated in a report to council by city auditor Ginder. "A study of the expenditures made by the city," the report says, "in the last ten years for the purpose of fire protection, and a comparison of this expenditure with the amount recovered because of fire losses, might easily convince one that the city, as a corporation, is over-insured. Past experience is the most equitable basis upon which to figure future payments for that purpose."

### Referendum on County Tax Limitation Law.

Sacramento, Cal.—The county tax elimination bill, passed by the last legislature, is subject to referendum vote at the next general election, or at a special election called before that time, the state supreme court at San Francisco has decided. The decision reverses the opinion of attorney general U. S. Webb, who submitted it as a test case to determine the question before the tax levying date. The bill was signed by governor William D. Stephens and was designed to limit and regulate amounts that each county should produce by tax levies and created a State Board of Authorization. A referendum was immediately launched against it under direction of the superintendent of public schools of Los Angeles, and others. More than 50,000 names were secured. The question arose as to whether the bill became immediately effective or not for ninety days, and therefore subject to referendum vote. Opposition to the bill was voiced principally in Los Angeles County, according to the attorney general's office, because of uncertainty as to its application to school districts. The suit before the supreme court was taken to force secretary of state Frank Jordan to place the measure on the

ballot in November, 1918, by referendum. Jordan had been advised that the act could not be submitted to a referendum because it was a tax measure. The decision follows a referendum brought against the bill by representatives of school organizations in the state, who feared that the law would be operated to cut down school appropriations. When the referendum petition was filed, secretary of state Jordan refused to receive it, being guided by the advice of attorney general Webb, who said it was not a subject for referendum, being a tax measure. The decision holds up the law until it can be voted upon by the people, and all the year's work performed by the Board of Authorization is nullified. The act created a board of authorization of five—the state controller, chairman of the board of equalization, a member of the board of control and two others to be appointed by the governor. They serve without pay. The singular feature of the case is that in every case the school boards in the various counties received every cent they asked for and in every case more than the year before. Every county had been heard from except Sacramento, which will not now have to file its budget.

## TRAFFIC AND TRANSPORTATION

### New Subway Section in Operation.

New York, N. Y.—The first section of the new Broadway subway of the Brooklyn Rapid Transit System has been put into operation. The section is about 1½ miles long. Through service is now given between Union Square and Coney Island. Trains leave Union Square every three minutes during the rush hours, and at other times every three and three-quarter minutes, except between 1 and 5 a. m., when the headway is fifteen minutes. The new line is calculated to relieve the old system of at least 15,000 persons daily in rush hours. It will enable many additional Manhattan workers who reside in Brooklyn to reach their homes for a 5-cent fare. The opening of the new section was attended by a number of public officials, and the guests were entertained by the Borough Park Heights Civic Association. Progress on the Broadway subway is such that it is expected to extend operation as far as Times Square before the end of the current year, and during 1918 it is expected that it will be completed to its terminal in the borough of Queens.

### Strike by Municipal Railway Employees.

Monroe, La.—The lines of the city-owned street railway have been tied by a strike of the employees. The union, in calling the strike, is protesting against the recent action of the city council in voting to instal one-man cars. The strikers declare that this is against their contract with the city which, they say, calls for a motorman and a conductor to operate each car.

### The San Francisco Car Strike.

San Francisco, Cal.—Violence has marked the continued bitterness in the strike of the employees of the United Railroads and service is intermittent and rather a challenge to the strikers than a convenience to the public. The company has made a number of attempts to run cars, an armored car being run in one trip. One employe was killed and a number injured. A grand jury committee, organized to bring about a settlement, has been unsuccessful, president Lilienthal of the company insisting that there is nothing to arbitrate. He asks adequate protection from the city and declares he can give full service with imported strikebreakers. Meanwhile the municipal car lines are reaping a harvest, the earnings for August being \$228,646, the largest month in the line's history, except August, 1915, during the year of the exposition. The Labor Day earnings were \$11,574, the highest for any one day. The city is running seven municipal buses which are proving very popular. The city has also, by arrangement with the Ocean Shore Railroad and the Southern Pacific lines, instituted a special municipal service to several big factories for the convenience of the workers. The Ocean Shore line provides the trains, engine crews and operation, while the city pays a fixed price for the trains, collects the fares, handles the transfers (free to all municipal lines) and assumes

responsibility for accidents. The city supervisors have adopted a resolution to investigate the finances of the company, and have been considering the possibility of forfeiting its franchises and taking over the operation of the lines. In a recent statement president Lilienthal said: "It is true that the men can force the company into bankruptcy, but that will do them no good. I think the public should realize that no dividends have been paid on stock of the United Railroads for years; that there are pending foreclosure proceedings on defaulted bonds, and another threatened on the unpaid 4 per cent bonds, upon which no interest has been paid. A majority of the bonds on which default has been made are held in California. With the growing competition of the Municipal Railroad and the competition of the jitney bus, our income has diminished. When I voluntarily gave our men a raise on July 1, realizing the increased cost of living, I figured out the last dollar I could spare." The men demand particularly recognition of the union and rates of wages similar to those paid by the city lines. The city board of health has warned the company that it is violating the new state housing law by quartering more than twenty men, the strikebreaking carmen, in one dormitory.

#### Company Forced to Buy New Cars.

New York, N. Y.—Defeated both in the state and federal courts in their efforts to resist the public service commission's order requiring the purchase of 250 additional cars, believed by the commission to be needed for the furnishing of adequate service on street surface lines in Brooklyn, the Brooklyn Rapid Transit Company and its subsidiary companies have notified the commission of their intention to proceed now with the necessary steps to comply with the order. The companies say: "The proceedings which we have taken and are taking in conformity to the order of the commission are taken under duress and fear of prosecution and are not to be regarded as admitting the validity of the commission's order or as evidence of waiver of these four companies' rights under the law and constitution." Referring to the companies' tardy acquiescence in the commission's order and the reference to "duress" and "compulsion" in the company's letter, William L. Ransom, chief counsel of the commission, who conducted the fight in the courts to compel the companies to comply with the commission's order, said: "Of course that is just what the Public Service Commission Law contemplates; namely, that if, as the state and federal courts have found and held, the commission after a fair, full hearing makes a reasonable order fully warranted by the evidence and demanded by the disclosed conditions, the companies shall obey it whether they like it and agree with it or not. If the commission makes a proper order and no court finds any reason for interfering with it, the statute of course contemplates that the companies shall be compelled to obey it, by statutory penalties or by criminal proceedings, if need be."

### MISCELLANEOUS

#### New Municipal Ice Plant.

Wadsworth, O.—The town of Wadsworth will have the first municipal ice plant in Ohio. City clerk H. E. Hiess succeeded in persuading the state industrial commission in Columbus to purchase \$10,000 worth of bonds issued for the erection of the plant. This plan was suggested by city solicitor F. O. Smoyer when other sources failed. The bonds will be awarded at once and the work of installing the plant will progress in time to have it completed by the beginning of summer, 1918.

#### General Goethals for Port Development.

New York, N. Y.—The New York and New Jersey port commissions have organized by appointing general George W. Goethals chief consulting engineer. The commissions elected J. Spencer Smith and William R. Willcox chairmen. The work, Mr. Willcox explained, will pertain to matters which affect the development of the port, the Jersey Meadows and all territory contiguous. The commissions, after they have concluded their investigations, will make reports to the New Jersey and New York legislatures.

### LEGAL NOTES

#### A Summary and Notes of Recent Decisions— Rulings of Interest to Municipalities

##### Bond for Jitney Operator—Liability of Surety.

Washington—Under Rem. Code 1915, § 5562—37 et seq., requiring jitney operator to give bond, elements of damages for which recovery may be had against principal enter into and form part of liability against surety to limit of amount of bond.—*Singer v. Martin*, 164 P. 1105.

##### Transfer of Powers—Continuation of Regulations.

New York—By Laws 1914, c. 495, providing powers given municipal explosives commission of city of New York are transferred to fire commissioner, etc., continuing in force regulations of commission, regulations were continued, not only during interregnum consequent on abolition of commission and transfer of its powers to fire commissioner, but for future.—*Stubbe v. Adamson*, 116 N. E. 372, 220 N. Y. 459.

##### Salary—Fixing—Recovery.

North Carolina—Resolution of city aldermen, allowing a sinking fund commissioner a specified annual salary for previous years, and charging against him certain items, leaving a balance due city, sufficiently fixes salary to authorize its recovery, although debits against him were invalid.—*Borden v. City of Goldsboro*, 92 S. E. 694.

##### Regulating Jitneys—Free Rides for Policemen and Firemen.

Pennsylvania—City's regulation of jitneys may include requirement of a reasonable bond to secure payment of damages recovered for loss of life or injury to person, etc., from their negligent operation. An ordinance requiring operators of jitneys to carry policemen and firemen in discharge of their duties free in any vacant seats was unreasonable and unenforceable.—*Jitney Bus Association of Wilkes-Barre v. City of Wilkes-Barre*, 100 A. 954.

##### Municipal Building—Limit of Cost.

Pennsylvania—Where municipal ordinances and notices of election on an increase of indebtedness state, as one item, certain sums for erection of a public building, which form is followed in the ballot, municipality may not erect such building at a cost greater than that so stated.—*Raff v. City of Philadelphia*, 100 A. 815.

##### Sinking Fund Bonds—Limitations on Tax Levies.

Ohio—In providing sinking fund to discharge bonds issued after June 1, 1915, in compliance with orders of state board of health issued and approved before that date, municipal taxing authorities should disregard the limitations on tax levies provided by Page & A. Gen. Code, §§ 5649—2 and 5649—3(a).—*State v. Dean*, 116 N. E. 37.

##### Contractor's Employee—Injury—Liability of City.

Kentucky—Employee of contractor to repair machinery in city's waterworks when on the premises is not a mere licensee, but an invitee, to whom it owes a duty as to safe condition of steps which he must use.—*Flutmus v. City of Newport*, 194 S. W. 1039.

##### Obstructing Sidewalk—Necessity.

West Virginia—In case of necessity, as the erection or repair of buildings upon adjacent private property, municipality may permit the temporary obstruction of sidewalk.—*Johnson v. City of Huntington*, 92 S. E. 344.

##### Right to Percolating Waters—Diversions.

Michigan—The right of a landowner to use percolating waters is none the less qualified by the rule of reasonable user, because it is a city and is seeping water for its inhabitants. Where a city may divert percolation waters from its land for its inhabitants without violating the rule of reasonable user, and in so doing is not harming plaintiff, it will not be enjoined; but plaintiff will be allowed damages for prior injury, with right to apply to the court in case of future injury.—*Schenk v. City of Ann Arbor*, 163 N. W. 109.



## THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

## ROADS AND PAVEMENTS.

**Bituminous:**

Cold Bituminous Mixture for Wood Floor Highway Bridges. Surfacing used by Illinois Highway Department. By B. H. Piepmeyer. 2 ills. 1,000 words. Engineering and Contracting, August 1. 10 cts.

Methods of Applying Bituminous Materials. Discusses cold surface, hot surface, and penetration surface binders. From a paper by G. Cameron Parker. 3,000 words. Good Roads, August 11. 10 cts.

Experimental Roads in Iowa. Results of experiments with bituminous carpet coats on gravel and concrete. Method of applying and type of oil recommended. 1,000 words. Municipal Journal, August 23. 10 cts.

**Concrete:**

Tests of Concrete Road Aggregates. Object and description of tests. Comparison of field and laboratory concrete. Conclusion. 2 ills. 4,000 words. From a paper by J. P. Nash. Good Roads, September 1. 10 cts.

Machinery Replaces Men on Concrete Road Building. On a Connecticut road, a road grader is used instead of hand grading and motor trucks transport all materials. Unloading sand and stone. 2 ills. 1,100 words. Municipal Journal, August 2. 10 cts.

Labor Saving Devices on Concrete Pavements. 200 words. Municipal Journal, August 2. 10 cts.

Resurfacing Old Concrete with New. Method in use in Wayne County, Mich. 500 words. Municipal Journal, August 9. 10 cts.

Construction Work on Du Pont Road. Stone and sand delivered in measuring boxes by industrial railway direct from railroad to mixer, eliminating wheelbarrow work. No expansion joint provided. Fresh concrete is protected by muslin screens. Nine ills. 1,800 words. Municipal Journal, August 2. 10 cts.

Concrete Paving on Connecticut Highway. Sand hauled during the previous winter. Elevating loaders and bins used in loading trucks and industrial cars. Equipment used. 2 ills. 1,250 words. Municipal Journal, August 1. 10 cts.

Methods of Installing Expansion Joints. 2 ills. 500 words. Engineering and Contracting, August 1. 10 cts.

Up-to-date Concrete Road Construction. Constructing the DuPont road. 4 ills. 600 words. Contracting, August 20. cts.

Removing Excess Water from Pavement Concrete. Tests show improved quality of material when surplus moisture is rolled out. From a paper by A. N. Johnson. 2,000 words. Concrete, August 20. cts.

Concrete Road-Building in Orange County, California. Method of construction described. By J. M. Brown. 8 ills. 1,250 words. Good Roads, August 4. 10 cts.

**Construction:**

Constructing the Storm King Road. Methods of construction where roadway has to be blasted in rock cliff 400 feet above the Hudson river. Compressed air used for power purposes. Protecting railroad track along river from falling debris. By A. C. Perkins. 8 ills. 1,800 words. Municipal Journal, August 23. 10 cts.

Cost of Constructing Pavements in St. Paul by Force Account. One-half page. Municipal Journal, August 23. 10 cts.

Some Road Grading Wrinkles. Street grading with wheel scrapers and steam shovel. Road roller hauls scarifier and scraper. Removing trees. 800 words. Municipal Journal, August 2. 10 cts.

Air Drills for Removing Pavement Surfaces. Use by 4 cities in making cuts in bituminous and concrete pavement. Tools used and some costs. 3 ills. 1,200

words. Municipal Journal, August 16. 10 cts.

Road-Building in North Carolina During the War. Changes due to war. Type of roads being built. From a paper by Joseph Hyde Pratt. 1,500 words. Good Roads, August 18. 10 cts.

Street Grader with Rotary Cutter Loads 250 Wagons a Day. 6 ills. 1,000 words. The Contractor, August 17. 10 cts.

Type of Shallow Grader Successful on Cook County Roads. 4 ills. 1,000 words. The Contractor, August 17. 10 cts.

Military Road Construction at Mount Gretna, Pa. 4 ills. 1,000 words. Engineering and Contracting, August 1. 10 cts.

State Force Builds 2 Miles of Military Road a Week. Slag piles used to hasten work. Much machinery used. 6 ills. 1,000 words. The Contractor, August 3. 10 cts.

Principles to Be Observed in Building of Federal Aid Roads. By J. W. Howard. 2,000 words. Good Roads, August 18. 10 cts.

**Convict Labor:**

Convict Labor Proves Effective on California Roads. Difficult construction in rough territory done at low cost. No armed guards. 700 words. Engineering News-Record, August 9. 15 cts.

Road Work with Convicts in Iowa. Results of 3 years' experience. Costs. Where convicts may be used advantageously. 1,000 words. Municipal Journal, August 16. 10 cts.

Prison Labor and Slag Surfacing Solve Ohio Road Problem. Mahoning County overcomes labor shortage by using convicts. Blast furnace slag makes good surfacing. 2 ills. 1,000 words. Engineering News-Record, August 30. 15 cts.

**Design:**

The Type of Road. Factors governing the selection. By Rodman Wiley. 1,200 words. Good Roads, August 4. 10 cts.

The Selection of Pavements. From a paper by W. A. McLean. 1,100 words. Good Roads, Sept. 1. 10 cts.

**Finance:**

Serial Bonds for Road Building Save Money. Tables and diagrams show that sinking fund and annuity methods cost taxpayers many millions. By M. O. Eldridge, Office of Public Roads and Rural Engineering. 5 ills. 4,000 words. Engineering News-Record, August 30. 15 cts.

Permanent Assessment Boards. To act in street opening and widening cases. Laws and practices in eight large cities. Proposed law for St. Louis. By Andrew Linn Bostwick. 1,200 words. Municipal Journal, August 30. 10 cts.

**General:**

Report Forms for Inspectors of Milwaukee County Highway Department. 3 ills. 500 words. Engineering and Contracting, August 1. 10 cts.

Viaduct for Grade Separation at Park Avenue and 42d Street, New York City. 1 ills. 1,200 words. Good Roads, August 25. 10 cts.

How the Surface of a Road Affects Tractive Effort. Unsurfaced concrete gives best results in California tests with steel tired wagons. Various surfaces compared. 5 ills. 1,200 words. Engineering News-Record, August 23. 15 cts.

New York Road Building Suffers from Sins of Past. Some contractors threw up work which state must finish at present high prices. 1,200 words. Engineering News-Record, August 2. 15 cts.

Construction Costs Reduced by Freight Bureau. New York Highway Department gives contractors assistance in getting road materials. 1,000 words. Engineering News-Record, August 9. 15 cts.

Irregular Street Intersection Area Calculations Simplified. By R. B. Gladding. 2 ills. 800 words. Engineering News-Record, August 9. 15 cts.

**Grade Crossings:**

Mechanical Means for Safeguarding Grade Crossings. 2 ills. 500 words. Engineering and Contracting, August 1. 10 cts.

**Granite:**

Using Old Stone Paving Blocks. Used for temporary pavement in Cleveland. 350 words. Municipal Journal, August 23. 10 cts.

**Legal:**

The Connecticut Motor Law. 3,500 words. Good Roads, August 18. 10 cts.

Massachusetts State Road Laws Codified. 5,000 words. Good Roads, September 1. 10 cts.

New Road Laws of Florida. 3,500 words. Good Roads, August 4. 10 cts.

**Machinery:**

Home-Made Unloaders Save Time on California Road Work. 1 ills. 600 words. Engineering News-Record, August 30. 15 cts.

Machinery on a New York Highway Grading with plow and scraper. Motor truck hauls and spreads stone, also hauling oil during the night. Rollers used as tractors. By W. Hardenbergh. 4 ills. 1,800 words. Municipal Journal, August 2. 10 cts.

Modern Road-Making Machinery. Care and use of machinery and the types and capacities of machines to be used on various kinds of construction. From a paper by W. Huber. 1,750 words. Municipal Journal, August 2. 10 cts.

Haulage Methods and Cost on Ohio Road Work. 600 words. Municipal Journal, August 9. 10 cts.

Caterpillar Tractor on Road Work. Some costs are given. 300 words. Municipal Journal, August 2. 10 cts.

Pneumatic Outfit Replaces Five Gangs Trenching Asphalt with Sledge and Wedge. 2 ills. 750 words. The Contractor, August 3. 10 cts.

Compressed Air in Street Excavation and Tamping. Drills and picks used in removing rock, concrete and macadam. Excavating and tamping trenches. By H. L. Hicks. 3 ills. 1,500 words. Municipal Journal, August 2. 10 cts.

Industrial Railways. Comparison as to efficiency and cost with motor trucks, tractors and teams. Use in highway work in 2 states. 2 ills. 1,200 words. Municipal Journal, August 2. 10 cts.

**Maintenance:**

Methods of Road Maintenance in Montgomery County, Alabama. From address by Thomas Edwards, County Engineer. 1,200 words. Good Roads, August 18. 10 cts.

Causes of Spring Breakups of New York State Highways. 758,000 sq. yds. of pavement broke through under traffic. Causes and method of repair. 1,250 words. Engineering and Contracting, August 1. 10 cts.

The Maintenance of Gravel Roads. Dragging; patching; resurfacing. By F. F. Rogers, State Highway Commissioner of Michigan. 1,200 words. Good Roads, August 25. 10 cts.

**Materials:**

Physical Tests for the Materials Used in Building Gravel and Sand-Clay Roads. By R. M. Green. 4,000 words. Good Roads, August 18. 10 cts.

Tests of Concrete Road Aggregates. 1,500 words. Engineering and Contracting, August 1. 10 cts.

**Oiling:**

Oiling Roads in Iowa. Oil recommended by highway commission. 300 words. Municipal Journal, August 9. 10 cts.

**Pavements:**

Pavement Problems on New York Bridges. From data prepared by Edward A. Byrne. 3 ills. 3,000 words. Municipal Engineering, August. 20 cts.

Street and Road Pavements. Their design and construction, with special reference to the concrete road. 6 ills. 2,500 words. Municipal Engineering, August. 25 cts.

**Paving and Road-Building.** Experience in Ann Arbor, Mich., during the past twenty years. From a paper by Manley Osgood, City Engineer. 2,800 words. Good Roads, August 11. 10 cts.

**Street Expenditures and Street Plans.** From a report by W. A. McQueen. 2,000 words. Good Roads, August 4. 10 cts.

**Cleveland United in Good-Paving Program.** City has plan for spending \$10,000,000 in municipal improvements. By N. C. Rockwood. 2 ills. 3,000 words. Engineering News-Record, August 2. 15 cts.

#### **Sand-Clay:**

**Construction of Sand-Clay Roads.** Selection and proportion of material. Construction of surface. From a bulletin from the Department of Agriculture. 1,100 words. Contracting, August. 20 cts.

#### **Sidewalks:**

**Pebble Surface Sidewalk.** 800 words. Concrete, August. 20 cts.

#### **State:**

**State Highway Work in Oregon.** 5 ills. 5,500 words. Good Roads, August 11. 10 cts.

#### **Traffic:**

**Asphalt Pavement Carries Heavy Traffic.** 5th Ave. and 42d St. has heaviest traffic. Mixture. 500 words. Municipal Journal, August 9. 10 cts.

**Extraordinary Traffic and Excessive Weights on Highways.** Causes of damage to road. By H. T. Wakelam, County Engineer, Middlesex. 5,000 words. The Surveyor, June 29. 40 cts.

**Extraordinary Traffic and Excessive Weights on Highways.** Discussion by institution of municipal and county engineers. 3,000 words. The Surveyor, July 6. 40 cts.

**Extraordinary Traffic and Excessive Weights on Highways.** Further discussion by institution of municipal and county engineers. 5,000 words. The Surveyor, July 13. 40 cts.

### **SEWERAGE AND SANITATION.**

#### **Activated Sludge:**

**Dewatering Activated Sludge at Urbana Sewage Station.** Rotary filter and especially designed centrifuge among devices tried. The latter gave 88 per cent. moisture sludge. 800 words. Engineering News-Record, August 9. 15 cts.

**Activated Sludge Process of Sewage Purification.** The Worcester experiment. By Thomas Calkin, City Engineer. 1 111. 7,000 words. The Surveyor, July 20. 40 cts.

**The Activated Sludge Process of Sewage Disposal.** Results at Worcester, England. 1,800 words. The Surveyor, July 27. 40 cts.

#### **Cleaning:**

**Sewer Cleaning in Aberdeen.** 300 words. Municipal Journal, August 2. 10 cts.

**Cleaning Sewers in Holland, Mich.** By R. B. Champion. 600 words. Municipal Journal, August 30. 10 cts.

#### **Concrete:**

**Concrete Sewer Pipe in Los Angeles.** A letter from E. P. Bent. 1,000 words. Concrete, August. 20 cts.

**Precast Concrete Pipe Plant Composite of Several Small Special Devices.** Funnel buckets, sugar scoop barrows, wood steaming jacket and double cross form are essential time saving features. 7 ills. 1,000 words. The Contractor, August 31. 10 cts.

#### **Construction:**

**Shovel Saves Labor in Laying Big Concrete Pipe.** Trench is excavated by shovel and clam shell and pipe laid by shovel. 1 111. 1,000 words. Engineering News-Record, August 23. 15 cts.

**Trench and Tunnel Excavation.** Various methods in use. By J. F. Springer. 7,000 words. Municipal Engineering, August. 25 cts.

**Tunneling Costs Less Than Trenching.** Detroit builds both big and little sewers in tunnel. Tunneling costs less than trenching where depth is greater than 20 feet and ground is stable. Tunneling machines increase speed for larger diameters. 5 ills. 3,000 words. The Contractor, August 3. 10 cts.

**Sewer Tunnelers Average 4 Inches Per Man Per Day.** Electric-driven compressors and hoists. Excavation by night shifts keeps street clear in day time. 5 ills. 1,800 words. The Contractor, August 3. 10 cts.

**Sewer Construction in Camden.** Three jobs now being completed. 5 ills. 850 words. The Contractor, August 17. 10 cts.

**Wooden Sewer Form Units 45 Ft. Long Moved Easily on Castors.** Saw mill on

job cuts lumber for big sewer forms. Traveling gravity mixer places invert concrete. Wire rope blasting mats protect water mains only a few feet away. 3 ills. 1,100 words. The Contractor, August 31. 10 cts.

**Sewer Work in Rock and Quicksand.** Comparative bids on brick and segment block sewer in St. Louis. Excavating by clam shell and trench machines. Handling trench in quicksand. By W. E. Hardenburg. 3 ills. 1,500 words. Municipal Journal, August 9. 10 cts.

**Work on Calumet Intercepting Sewer.** Excavating in quicksand and clay with steam shovel and drag line. Handling excavated material and concrete aggregate. By A. R. Reilly. 1,100 words. Municipal Journal, August 23. 10 cts.

**Building a Big Pipe Sewer in Columbus.** 3 ills. 1,000 words. Concrete, August. 20 cts.

#### **General:**

**Retaining Dams Prevent Overflow of Sewers at Binghamton.** Sidehill streams which used to fill with debris and cause floods now controlled by dams and paved channels. By W. Earl Weller, City Engineer. 5 ills. 1,500 words. Engineering News-Record, August 2. 15 cts.

**Handling Stone for a Sprinkling Filter.** Details of Method at sewage disposal plant at Fort Benjamin Harrison. Force employed and amount moved daily. 1 111. 1,500 words. Municipal Journal, August 30. 10 cts.

**Objectionable Features of Sprinkling Filters and the Cause.** Reports from 14 cities. 2,200 words. Engineering and Contracting, August 8. 10 cts.

#### **Operation:**

**Operating Methods at Chain of Rocks Filter Plant, St. Louis, Mo.** 3,000 words. Engineering and Contracting, August 8. 10 cts.

**Sewage Disposal at Fitchburg.** Report on operation during 1916. Growths and ice on filters. Handling sludge. 2,000 words. Municipal Journal, August 23. 10 cts.

#### **Segment Block:**

**Segment Block Sewer Fails.** Two breaks occur in 4-ft. sewer. Probably due to poor shaping of bottom of trench. By S. U. Misner. 1 111. 600 words. Engineering News-Record, August 2. 15 cts.

#### **Sewers:**

**Manhole for Separate Sewers in Same Trench.** 3 ills. 800 words. Municipal Journal, August 23. 10 cts.

**Sewerage System of Daytona.** Complete collection on treatment system. Screening, chlorine disinfection and pumping of sewage. 14 ejectors, operated by compressed air at several stations. By Geo. A. Main. 2 ills. 2,800 words. Municipal Journal, August 30. 10 cts.

#### **Treatment Plants:**

**Changes in Cleveland Sewage Disposal Plans Recommended.** Fine screens are advised by Fuller after adverse report by other engineers. Will be treated with chlorine in summer at two plants. Sprinkling filters and Dortmund tanks at other plant. 5,500 words. Engineering News-Record, August 16. 15 cts.

**Modern Sewage Purification Works.** Design, Construction and Management. By Chas. Terry. 2,800 words. The Surveyor, June 29. 40 cts.

**Remodeling Small Sewage Works in California.** Stream pollution suit leads to replacing makeshift filter with sprinkling filter. Final settling tank added. 2 ills. 1,000 words. Engineering News-Record, August 30. 15 cts.

#### **Wastes:**

**Purification of Tannery Wastes.** Results of study of method of purifying liquid waste from representative plant of several industries. 4,000 words. Engineering and Contracting, August 8. 10 cts.

### **WATER SUPPLY.**

#### **WATER SUPPLY**

##### **Construction:**

**Machine Trenching for Water Pipes.** Syracuse Municipal Water Department owns machine which it uses for all trenching for water pipes. Record of 13 days' run. By H. C. Allen, City Engineer. 1 111. 800 words. Municipal Journal, August 2. 10 cts.

**Build Concrete Shell Around Tall Steel Water Tanks.** Panel forms and staging held by bolts and raised from floats. Concrete was nearly continuous. Road was built for delivery of material. 3 ills. 1,500 words. Engineering News-Record, August 16. 15 cts.

**Submerged Water Main Linked up on River Bank and Floated Across.** Displaced water nearly supports 12-inch cast iron pipe line. 1 111. 600 words. The Contractor, August 3. 10 cts.

#### **Dams:**

**Island Lake Storage Dam Has Immense Log Sluice.** Description of dam. 3 ills. 2,000 words. Engineering News-Record, August 2. 15 cts.

**Tunnel from Below to Build Diversion Dam.** 3 ills. 1,600 words. Engineering News-Record, August 30. 15 cts.

**Concrete Dam 17 Feet High Has Automatic Plug Gates.** Describes dam at Nashua, Iowa. 2 ills. 1,500 words. Engineering News-Record, August 9. 15 cts.

**Australian Concrete Dam Impounds Billions of Brisbane.** Structure is 125 feet high and filled with rock plums. Face is of rich concrete reinforced. By John Peart. 3 ills. 600 words. Engineering News-Record, August 9. 15 cts.

#### **General:**

**Water Hammer Formulas.** 1,200 words. Engineering News-Record, August 16. 15 cts.

**Color Records Applied to Potable Water.** By J. S. Pickering. 3 ills. 5,000 words. The Surveyor, July 6. 40 cts.

**Power and Water Bureau Shops of Los Angeles.** Municipal warehouse, machine shops and central receiving station. Testing electric meters. By C. W. Geiger. 4 ills. 2,000 words. Municipal Journal, August 9. 10 cts.

**Filter Plates Made Best Showing in Air-Diffuser Tests.** 800 words. Engineering News-Record, August 9. 15 cts.

**Cost of Chemicals for Chain of Rocks Filter Plant.** 1,250 words. Engineering and Contracting, August 8. 10 cts.

**Unloading Pipe from Gondola Cars by Motor Truck.** 600 words. Engineering and Contracting, August 8. 10 cts.

**Traveling Field Laboratory of New Jersey State Health Department.** 2 ills. 1,000 words. Engineering and Contracting, August 8. 10 cts.

**Recent Progress and Tendencies in Municipal Water Supply in the United States.** From a paper by John W. Alvord. Continued from former issue. 1,800 words. Fire and Water Engineering, August 1. 10 cts.

#### **Meters:**

**As Water Meters Increase, Water Consumption Falls.** Statistics from 68 cities. 1,000 words. Engineering News-Record, August 16. 15 cts.

#### **Operation:**

**Imperfect Washing of Filter Causes Aftergrowths.** Probably due to accumulation of sand in the under drain. 800 words. Engineering News-Record, August 9. 15 cts.

**Operating the St. Louis Filters.** Adjusting and testing meters and gauges. Determining details of filter washing. Mixing and applying chemicals. 3,500 words. Municipal Journal, August 16. 10 cts.

#### **Pipe:**

**Cast Iron Pipe Prices During the Past Fifty Years.** 2 1/4 pages. Engineering and Contracting, August 29. 10 cts.

#### **Pollution:**

**Finding and Stopping Pollution of Austin Water Supply.** Surface drainage and lack of sewers chief source of infection. By Julian Montgomery. 1 111. 1,600 words. Engineering News-Record, August 23. 15 cts.

#### **Pumping:**

**Large Capacity Deep Well Irrigation Pumping Installation in Texas Panhandle.** 5 ills. 750 words. Engineering and Contracting, August 8. 10 cts.

#### **Service Charge:**

**Service Charge—How Constituted.** From a paper by J. N. Chester. 1,250 words. Fire and Water Engineering, August 8. 10 cts.

#### **Supply:**

**Drainage—Basin and Crop Studies Aid Water Supply Estimates.** In this article is described a new kind of survey and the use of data derived therefrom. By R. E. Horton. 3,500 words. Engineering News-Record, August 23. 15 cts.

**Rational Study of Rainfall Data Makes Possible Better Estimates of Water Yield.** Suggest what improvements over common practice are advisable in the use of rainfall data. By Robt. E. Horton. 2 ills. 2,500 words. Engineering News-Record, August 2. 15 cts.

#### **Vitrified:**

**Joint Leakage in Vitrified Pipe Line.** From a paper by W. W. Brush. 5 ills.



2,500 words. Municipal Engineering, August. 25 cts.

**Waste:**

Water Waste Prevention in Cork. Results of efforts to decrease waste and results. By J. F. Delany, City Engineer. 4 ills. 1,000 words. The Surveyor, July 27. 40 cts.

**Waterworks:**

Water Works Statistics. Reports from several states. 2 pages. Fire and Water Engineering, August 15. 10 cts.

Water Works Statistics. Reports from Kansas, Kentucky, Louisiana, Maine, Maryland and Massachusetts. Fire and Water Engineering, August 8. 10 cts.

Water Works at Columbus, Ga. 800 words. Fire and Water Engineering, August 16. 10 cts.

Water Supply at Fort Benjamin Harrison Nears Completion. Water is pumped from infiltration well and gallery to concrete reservoir. Is chemically treated. 1 ill. 800 words. Engineering News-Record, August 9. 15 cts.

Ystradfellte Waterworks. Description of plant. By D. M. Davies. 1 ill. 2,500 words. The Surveyor, August 10. 40 cts.

**STREET LIGHTING AND POWER.**

Road Illumination by Means of Automobile Head Lamps. This article deals with the distribution of light and the intensity of light from the automobile head lamp. The author suggests that regulations governing the glare from head lamps should not only specify the limitations of glare but also what devices can and what devices cannot be made to eliminate glare when properly adjusted and installed. By H. P. Gage. 29 ills. 3,000 words. General Electric Review, September. 20 cts.

Loss of Heat Through Bare Pipes. Formulas for computing loss. By W. F. Schaphorst. 1 ill. 1,000 words. The Gas Age, August 15. 20 cts.

Effect of the War on Street Lighting. Although prices are the highest in the history of the industry and the bond market is not favorable, there will be usual activity. By F. A. Vaughn. 2 ills. 1,250 words. Electrical Review, September 1. 10 cts.

Park Lighting in St. Louis. Standards made by city of concrete and of iron pipe. 2 ills. 700 words. Municipal Journal, August 9. 10 cts.

Method of Laying Submerged Gas Main in Winter. 1,100 words. Engineering and Contracting, August 8. 10 cts.

The Relation of Lighting to Industrial Safety. Close connection between poor lighting and industrial accident. By J. A. Hoeveler. 7 ills. 3,000 words. Electrical Review, September 1. 10 cts.

Shortage of Power Raises a Problem. Several cities report power shortages. 1,600 words. Electrical World, August 25. 10 cts.

**FIRE.**

Salaries of Firemen. Comparison of pay in several cities. 500 words. Fireman's Herald, August 18. 5 cts.

Salaries of Firemen. What they are being paid in cities throughout the country. 500 words. Fireman's Herald, September 1. 5 cts.

Fireman at a Training School. Some of the physical lessons given every week by the Los Angeles Fire Department. 500 words. Fireman's Herald, September 1. 5 cts.

Arguments for Two Platoons. 750 words. Fireman's Herald, August 18. 5 cts.

Shingles under a Blow-Torch. Interesting results of official tests of various materials. 1,000 words. Fireman's Herald, August 18. 5 cts.

Fire Pumps. First of a Series of Articles. 3,000 words. The Fire Engineer, August. 10 cts.

Attack on Two Platoons. Figures of comparative costs of fire service in 10 cities. 1,500 words. Fireman's Herald, September 1. 5 cts.

Cooperative Fire Fighting. The standardization of hose couplings. By E. M. Griswold. 1,500 words. Fireman's Herald, August 4. 5 cts.

The Storage Battery for Fire Alarm Telegraph Systems. By W. A. Tiffany. 1,000 words. Fire and Water Engineering, August 22. 10 cts.

Newport's Fire Department. A report of the National Board of Fire Underwriters. 2,000 words. Fireman's Herald, August 4. 5 cts.

**MOTOR VEHICLES.**

Electric Vehicles in Municipal Service. Results obtained in Manchester by a 1-ton electric truck. By S. L. Pearce. 2,500 words. The Surveyor, July 6. 40 cts.

Electric Vehicles for City Refuse Collection. Report from Sheffield, England, demonstrates economy of electric over horse-drawn vehicles. 1 ill. 1,200 words. Electrical Review, August 11. 10 cts.

Electrical Vehicles and Their Use in Cleansing Work. Discussion by institute of cleansing superintendents. 3,000 words. The Surveyor, July 27. 40 cts.

Electric Vehicles and Their Use on Cleansing Work in Sheffield. By J. A. Priestley, Cleansing Superintendent. 1 ill. 4,000 words. The Surveyor, July 13. 40 cts.

Bonus for Motor Truck Drivers. 500 words. Engineering and Contracting, August 1. 10 cts.

Control of Omnibus and Other Motor Traffic. By H. T. Chapman, County Surveyor, Kent. 2,500 words. The Surveyor, July 27. 40 cts.

Motor Vehicles in Municipal Work. Report from more than 100 cities in regard to use of motor vehicles by the cities. 3 1/2 pages. Municipal Journal, August 2. 10 cts.

Motor Vehicles in Spokane City Work. 54 are used by the city. 13 sprinkler trucks built by the city fire department. By Henry F. Nelthorpe. 2 ills. 2,000 words. Municipal Journal, August 2. 10 cts.

Parking in Cities. Practice of several cities in regard to parking automobiles. 400 words. Municipal Journal, August 9. 10 cts.

State Motor Truck Laws. Charges made by each of the states for trucks of various weights, powers, tire construction, uses, etc. 1,200 words. Municipal Journal, August 30. 10 cts.

**CITY PLANNING.**

Berkeley, Cal., Zone Ordinance. 2,000 words. Engineering and Contracting, August 1. 10 cts.

Wisconsin Enacts Three Notable Planning Laws. Zoning by city plan commissioners made possible. Street-widening procedure authorized. Building-setback control. By S. J. Williams. 1,000 words. Engineering News-Record, August 2. 15 cts.

**STREET CLEANING AND REFUSE DISPOSAL.**

Worcester Owns and Operates a Model Garbage Disposal Pigery. City collects garbage and hauls it many miles to poor farm where it is fed to hogs under modern sanitary conditions. Fish offal is buried. Many cost data are given. By Frederick Bonnet, Jr. 8 ills. 3,200 words. Engineering News-Record, August 30. 15 cts.

Springfield Garbage Disposal Report. Past and present methods of disposal in Springfield. Factors in selection of method, income obtainable and amount of garbage. 2,800 words. Municipal Journal, August 9. 10 cts.

Community Piggeries. 300 words. Municipal Journal, August 9. 10 cts.

Cleansing Work at Nottingham. Garbage destructors. Use of clinkers. Other cleansing and disposal work. By J. Terry. 3,000 words. The Surveyor, July 20. 40 cts.

Street Cleaning in Houston. Motor sprinklers do the work more cheaply than mule-drawn. Costs of sweeping and sprinkling. 1,000 words. Municipal Journal, August 2. 10 cts.

Utilizing Old Tin Cans. 800 words. Municipal Journal, August 30. 10 cts.

**BRIDGES.**

Automatic Devices Reduce Manual Labor to Minimum on Concrete Bridge. From gravel banks in river need to concrete in form men merely direct machines which dig, wash, screen, store, convey, mix and place the materials. By V. H. Drufner. 5 ills. 1,100 words. The Contractor, August 31. 10 cts.

Gravity Mixer and Derrick Place Bridge Concrete. Balanced cable cars deliver concrete from derricks hoisting to

forms. Pebble surface finish placed with body concrete. 6 ills. 1,000 words. The Contractor, August 31. 10 cts.

Points in Steel Bridge Maintenance. Stronger lateral and portal systems lengthen life of bridge. 5 ills. 1,200 words. Engineering News-Record, August 30. 15 cts.

Test Wells for Alaska Bridge Sunk Through Ice. Wash-drill boring rig is hauled 160 miles. 4 ills. 1,100 words. Engineering News-Record, August 30. 15 cts.

Low Water Concrete Bridges. Type adopted where rivers are dry much of the year and flooded for short periods. 1 ill. 500 words. Municipal Journal, August 9. 10 cts.

Approximate Methods Desirable for Arch Design. Will give results close to those obtained by full elastic analysis. By J. B. Cox. 1,000 words. Engineering News-Record, August 9. 15 cts.

Bridging Drainage Ditches. Type of structure best suited for use on this work. From a paper by C. E. Nagel. 600 words. Municipal Journal, August 30. 10 cts.

Cantilever Concrete Bridge Has Suspended Link. Structure is placed on pile foundation so that settlement or dynamite can affect one pier only. 1 ill. 1,000 words. Engineering News-Record, August 2. 15 cts.

Temporary Hinges Advantageous in Concrete Arch Erection. By D. F. Steinman. 1,000 words. Engineering News-Record, August 2. 15 cts.

Building a Bridge Under Adverse Conditions in San Domingo. Lack of local material and of skilled labor main difficulties. By E. S. Needham. 2 ills. 2,000 words. Engineering News-Record, August 23. 15 cts.

Kentucky Road Department Has Standard Bridges. Standard Designs for state-aid structures. Small spans are concrete girders, large ones steel trusses. 1,300 words. Engineering News-Record, August 9. 15 cts.

Paints for Metal Surfaces. Materials for prevention of rusting. Galvanized and tin surfaces. From a paper by H. A. Gardner. 1,250 words. Municipal Journal, August 30. 10 cts.

Steel Bridge Standards of the Ontario Department of Public Highways. From a paper by George Hogarth, Chief Engineer. 5 ills. 2,000 words. Good Roads, August 25. 10 cts.

**GOVERNMENT AND FINANCE.**

License Fees in Wisconsin Cities. 1,000 words. Municipal Journal, August 9. 10 cts.

Fundamental Features of a Sound Public Utility Bond. A discussion of the legal, physical and economic considerations which affect the security of a public utility bond. By F. K. Schrader. 5 ills. 5,000 words. Electrical Review, August 11. 10 cts.

**MISCELLANEOUS.**

Engineer Ousted as City Manager of Portsmouth, Va. Council interferes with and finally discharges manager. 1,600 words. Engineering News-Record, August 2. 15 cts.

Method and Cost of Thawing Frozen Ground with Steam. 800 words. Engineering and Contracting, August 8. 10 cts.

Valuation and Appraisal of Public Service Property. One of a series of articles on valuation for rate making. By A. S. B. Little. 2,500 words. The Gas Age, August 1. 20 cts. 2,500 words. August 15. 20 cts.

Cost Plus Percentage Form of Contract of Bureau of Yards and Docks. 2,800 words. Engineering and Contracting, August 29. 10 cts.

Trend of Wages of Common Labor from 1906 to 1917. 1 ill. 600 words. Engineering and Contracting, August 29. 10 cts.

Price Changes for Common Labor and Construction Material During the Past Year. Prevailing figures from various cities throughout the country. 1 page. Engineering and Contracting, August 29. 10 cts.

Topographic Map for Beverly. 600 words. Municipal Journal, August 30. 10 cts.

Camp Management Helps to Solve California Labor Problems. Desirable men attracted by good food and living conditions rather than by prospect of easy

(Continued on page 276.)

## NEWS OF THE SOCIETIES

### Calendar of Meetings.

**Sept. 10-15.—NATIONAL EXPOSITION OF SAFETY AND SANITATION.** Annual conference, New York, N. Y. Secretary, W. C. Cameron, Continental and Commercial Bank building, Chicago, Ill.

**Sept. 11-13.—AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS.** Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash.

**Sept. 11-14.—AMERICAN ASSOCIATION OF PORT AUTHORITIES.** Annual convention, Cleveland, O. Secretary, W. T. Barney, 29 Broadway, New York, N. Y.

**Sept. 11-14.—INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.** Annual convention, Niagara Falls, N. Y. Secretary, Clarence R. George, Houston, Tex.

**Sept. 11-14.—NEW ENGLAND WATERWORKS ASSOCIATION.** Annual convention, Hartford, Conn. Secretary, Willard Kent, 715 Tremont Temple, Boston, Mass.

**Sept. 18-20.—LEAGUE OF IOWA MUNICIPALITIES.** Annual convention, Iowa City. Secretary, Frank G. Pierce, Marshalltown, Ia.

**Sept. 18-20.—LEAGUE OF VIRGINIA MUNICIPALITIES.** Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

**Sept. 19-20.—UNION OF ALBERTA MUNICIPALITIES.** Annual convention, Calgary, Alberta. Secretary, J. D. Saunders, Camrose, Alberta.

**Sept. 24-28.—CALIFORNIA CONFERENCE ON CITY PLANNING.** Annual conference, Santa Rosa, Cal. Secretary, Charles H. Cheney, Crocker Building, San Francisco, Cal.

**Sept. 24-29.—LEAGUE OF CALIFORNIA MUNICIPALITIES.** Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

**Sept. 24-29.—THIRD NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES.** Exposition, Grand Central Palace, New York City.

**Sept. 25-27.—SMOKE PREVENTION ASSOCIATION.** Annual convention, Columbus, O. Secretary, Frank A. Chambers, City Hall, Chicago, Ill.

**Sept. 25-27.—LEAGUE OF WISCONSIN MUNICIPALITIES.** Annual convention, Racine, Wis. Secretary, Ford H. MacGregor, Madison, Wis.

**Sept. 27, 28.—CANADIAN PUBLIC HEALTH ASSOCIATION.** Annual congress, Ottawa, Ont. Secretary, J. G. Fitzgerald, M. E., Toronto, Ont.

**Sept. 27-29.—AMERICAN AND CANADIAN ENGINEERS AND ARCHITECTS OF NORWEGIAN BIRTH OR DESCENT.** Informal congress and re-union, Chicago Norske Klub, Chicago, Ill. Chairman, Committee on Arrangements, Joachim G. Glaver, consulting engineer, Chicago, Ill.

**Oct. 10.—UNION OF BRITISH COLUMBIA MUNICIPALITIES.** Annual convention, Duncan, B. C. Secretary, Ex-Reeve H. Bose, Survey Center, B. C.

**Oct. 15-17.—NATIONAL HOUSING ASSOCIATION.** Annual conference, Hotel La Salle, Chicago, Ill. Secretary, Lawrence Veiller, 105 East 22d St., New York City.

**Oct. 16-19.—LEAGUE OF KANSAS MUNICIPALITIES.** Annual convention, Wichita, Kan. Secretary, Homer Talbot, University of Kansas, Lawrence, Kan.

**Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES.** Fifth annual convention, St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

**Oct. 17-19.—AMERICAN PUBLIC HEALTH ASSOCIATION.** Annual meeting, Washington, D. C. Acting Secretary, A. W. Hedrick, 126 Massachusetts Avenue, Boston, Mass.

**Oct. 22-24.—AMERICAN CIVIC ASSOCIATION.** Annual meeting, St. Louis, Mo. Secretary, Richard B. Watrous, 914 Union Trust building, Washington, D. C.

**Oct. 28-30.—TEXAS CONFERENCE ON SOCIAL WELFARE.** Annual convention, Houston, Texas.

**Nov. 19-24.—CITY MANAGERS' ASSOCIATION.** Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

**Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA.** Recreation Congress, Milwaukee, Wis. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

**Nov. 21-24.—NATIONAL MUNICIPAL LEAGUE.** Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton Rogers Woodruff, 703 North American Bldg., Philadelphia, Pa.

**Jan. 15-17.—VIRGINIA GOOD ROADS ASSOCIATION.** Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

**Feb. 6-13.—FIRST CHICAGO CEMENT MACHINERY AND BUILDING SHOW.** Supersedes annual Chicago Cement Show. Held at the Coliseum, under direction of the National Exhibition Co.

### The American Public Health Association.

A war meeting will be held at Washington, D. C., Oct. 17-20, 1917, by the American Public Health Association. This will replace the annual meeting which was to be held at New Orleans, La., Dec. 4-7, 1917.

The papers and conferences will deal largely with the health problems created by the Great War—the food supply, communicable diseases among soldiers, war and venereal disease, war and the health of the civil population, etc.

Washington will be crowded and those interested are urged to reserve hotel accommodations at once. It will be easy to cancel reservations; but it may be impossible to obtain rooms at the last moment. Any hotel or railroad can give a list of Washington hotels.

Preliminary programs will be automatically mailed to all members of the A. P. H. A. about Sept. 15. Non-members may receive them free by writing to The American Public Health Association, 128 Massachusetts avenue, Boston, Mass.

### National Municipal League.

In connection with the National Municipal League meeting at Detroit, November 21-23 inclusive, the following divisions of its activities and associations will meet with it: Intercollegiate Division of N. M. L., Association of Governmental Research Agencies, Society for the Promotion of Training for Public Service, Civic Secretaries, City Managers' Association.

### National Association of Purchasing Agents.

The National Association of Purchasing Agents will hold its 1917 convention at the William Penn Hotel, Pittsburgh, Pa., October 9, 10 and 11. This hotel is to be convention headquarters, where all sessions and gatherings, public and closed will be held, including the annual banquet. Men of national prominence are to be present as speakers. The details of the convention are being arranged by Robert F.

Blair of Pittsburgh Gage & Supply Company. The president of the National Association is E. L. McGrew, of Standard Underground Cable Company. An attendance of 1,500 members is expected. This meeting assumes importance, as the association is being recognized as a clearing house of information of interest to purchasing agents and the houses which they represent.

### National Electrical Contractors' Association.

The annual convention of the National Electrical Contractors' Association will be held on Oct. 10 to 13 at New Orleans, La. H. C. Brown, Utica, N. Y., is secretary of this association.

### American Electrochemical Society.

The next meeting of the American Electrochemical Society will be held at Pittsburgh, Pa., Oct. 3 to 6. One of the features of this meeting will be a session devoted to the application of electrochemistry and electric furnaces to the manufacture of war supplies and munitions. An address by Alex Dow, president of the Detroit Edison Company, on "Production of Steam from Coal," will be another of the features of this meeting.

### Kansas Public Service Association.

This association will hold its annual meeting at Salina, Kan., Oct. 19 and 20. W. W. Austin, Cottonwood Falls, Kan., is secretary.

### Albemarle Highway Association.

At the annual meeting of the Albemarle Highway Association, held at Charlottesville August 29, officers were elected for the ensuing year as follows: Milton C. Elliott, of Washington, D. C., president; George Austen, Ralph Ortman, Russell Bargamin, C. A. Greens, Frank Y. Hall, Prof. Wm. H. Echols and William H. Wood, vice-presidents; A. G. Burnett, secretary; S. S. Teel, Treasurer. The directors at large are: Hellis Rinehart, Wm. R. Duke, Samuel M. Page, E. D. Taylor, and J. E. Shepherd.

### League of Iowa Municipalities.

The committee in charge of the preparations for the 20th annual convention of the League of Iowa Municipalities has just made public the complete program, beginning Tuesday, Sept. 18, and continuing three days and evenings.

At this meeting many subjects of great importance will be discussed by men who have made a study of the subjects and are prepared to speak with authority. The entertainment to be furnished by the Iowa City entertainment committee will be unique and it is hoped will be enjoyed by all present. A large attendance is anticipated.

The short course for health officers of the state will be held coincident with the state meeting of the League of Iowa Municipalities, Sept. 18 to 22. This is the first time in the history of the state that health officers have been provided with anything along this line.



of instruction and a large attendance is anticipated.

The annual meeting of the League of Municipalities is regarded of such importance, that under the present state law, the expenses of the delegates from each city or town, may be paid out of the public treasury. The health officers' short course is of equal importance in providing the county, city and township officers with a knowledge not only of what to do to guard the public health, but how to go about it and what legal authority they have and what co-operation may be expected or demanded at the hands of the police officers or sheriffs of the state.

In many cases it is thought cities and towns will name their health officers as delegates to the municipal convention in order that they may also attend the health officers' course of lectures.

#### Oregon Electrical Contractors and Dealers.

The second annual convention of the Oregon Association of Electrical Contractors and Dealers will be held at Eugene, Ore., September 17-18. Among

the addresses will be one on "Business Methods and Outlook" by C. D. Rorer, president of the Bank of Commerce, Eugene; on "Oregon's Electrical Industry" by Franklin T. Griffith, of Portland, president, Portland Railway, Light & Power Company; "The Need of Proper Electrical Inspection and How to Organize an Electrical Inspection Department" by I. F. Dunlap, chief electrical inspector, Bureau of Buildings, Portland; "The Electrical Jobber," by J. J. Colwell, northwest manager, Western Electric Company, Seattle.

### PERSONALS

Bates, George, has been made chief of the fire department of Cheyenne, Wyoming, succeeding T. A. McCleave.

Battle, Dr. W. W., has been appointed city chemist of Dallas, Texas, succeeding Dr. N. C. Hamner, who has resigned after six years of service.

Brown, R. T., formerly highway engineer for Davidson company, N. C., has been appointed assistant engineer

with the South Carolina Highway Department.

Darlington, E. B., chief engineer and superintendent of the Salmon River Irrigation Project, Idaho, has been appointed chief engineer of the Twin Falls Northside Land and Water Co. Irrigation Project, succeeding C. R. Burkey, who has resigned to attend the Officers' Training Camp at Presidio.

Durney, Dr. Edward, has been appointed deputy health commissioner of Buffalo, to act during the absence on military duty of Dr. A. C. Schaefer.

Forbess, Miss Elba, has been appointed recreation supervisor for Fort Worth, Texas.

Hoffman, J. D., has been appointed professor of practical mechanics at Purdue University. Mr. Hoffman has been in charge of the department of mechanical engineers of the University of Nebraska, since 1911.

The firm of Geo. B. Post & Sons, architects, and the organization headed by Ernest P. Goodrich, engineer, with headquarters in New York, have become associated professionally in the practice of architecture, engineering and planning. The architect's office is at 101 Park Avenue, and the engineer's office at 261 Broadway, New York City. The object of the closer association between the two organizations is to permit of a wider latitude of practice and more intensive co-operation in the design and execution of engineering and architectural works in general, and in particular in city planning, workingmen's housing and industrial developments.

Geo. B. Post & Sons have been the architects for many prominent buildings in this country, among them the Wisconsin State Capitol, the College of the City of New York, the New York Stock Exchange, the Prudential Life buildings in Newark, the Statler hotels in Cleveland, Detroit and St. Louis, and numerous banks, office buildings, hospitals, and other structures in New York and other parts of the country.

Ernest P. Goodrich is a consulting engineer of national reputation and has served as consulting engineer to New York City, Newark, Portland, Ore., and many other municipalities. He is the designer of the Bush Terminal in South Brooklyn and is the director of the Bureau of Municipal Research. A. Pearson Hoover, associate of Ernest P. Goodrich, is an authority on grade crossing elimination and industrial developments, and is the engineer for the Paterson (N. J.) Industrial Development Company.

George B. Ford, of the firm of Geo. B. Post & Sons, has served as consultant on city planning to a score of cities in America. In all of this work he has cooperated with Mr. Goodrich, and together they have made city planning investigations or prepared plans for Jersey City, N. J., Newark, N. J., Omaha, Neb., East Orange, N. J., Mansfield, Ohio, and a number of other places.

### PROBLEMS CITIES ARE STUDYING WITH EXPERTS

STREET IMPROVEMENTS are being made by Ladd, Ill. The engineer for the work is S. D. Porter, 605 Gooding Street, La Salle, Ill.

A WATERWORKS SYSTEM is to be built by Towanda, Kans. Plans and specifications were prepared by F. E. Devlin, Eldorado, Kans.

Bids are being received by Luray, Kans., on machinery for an ELECTRIC LIGHT plant and WATERWORKS improvements. In preparing the plans, the city called upon George C. Shaad, Lawrence, for advice.

Elm Grove, W. Va., is making a number of STREET IMPROVEMENTS. The engineer for the work is H. L. Maddocks, 405 Newark Trust Building, Newark, Ohio.

Pickens County, Carrolton, Ala., is making extensive ROAD and BRIDGE improvements. The engineer for the projects is G. E. Hauser, First National Bank Building, Columbus, Miss.

Cambria County, Pa., is to construct a reinforced concrete BRIDGE, following the preparation of plans by the consulting engineer, J. L. Elder, Jr., Ebensburg, Pa.

A SEWER SYSTEM and DISPOSAL PLANT are to be built by Rocky River, Ohio. The consulting engineer for the improvement is R. Winthrop Pratt, Hippodrome Building, Columbus, Ohio.

The Fabius River drainage district, Quincy, Ill., in carrying out new DRAINAGE work, had the plans prepared by the E. T. Perkins Engineering Co., 38 South Dearborn Street, Chicago, Ill.

The village of Rice, Minn., is to build an ELECTRIC LIGHT PLANT. The architect and engineer for the improvement is L. W. Schaefer, St. Cloud, Minn.

Estherville, Iowa, is receiving bids for constructing SEWERAGE systems from plans prepared by K. C. Gaynor, 405 Frances Building, Sioux City, Iowa.

Du Bois, Pa., is to build a new BRIDGE. The engineer for the proposed improvement is G. A. Flink, 301 Commonwealth Trust Building, Harrisburg, Pa.

SEWAGE DISPOSAL WORKS are to be constructed by Stamford, Conn. Plans and specifications for the plant have been completed by the consulting engineers, Fuller & McClintock, 170 Broadway, New York, N. Y.

The city of Dayton, Ohio, in preparing plans for a concrete RESERVOIR, called upon Metcalf & Eddy, 14 Beacon Street, Boston, Mass., and Harris Trust Building, Chicago, as consulting engineers.

A SEWERAGE SYSTEM and DISPOSAL WORKS, to cost \$350,000, are to be built by Greenwich, Conn. The city has retained Clyde Potts, 30 Church Street, New York, N. Y., as consulting engineer.

Floydada, Tex., is receiving bids on about 20,000 sq. yards of PAVEMENTS. The work also contemplates designs for STORM and SANITARY SEWERS, which are not to be installed at this time. Henry E. Elrod, Interurban Bldg., Dallas, has been retained by the city as consulting engineer.

## NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

### EASY PIPE PUSHER.

#### For Economy in Underground Service Work.

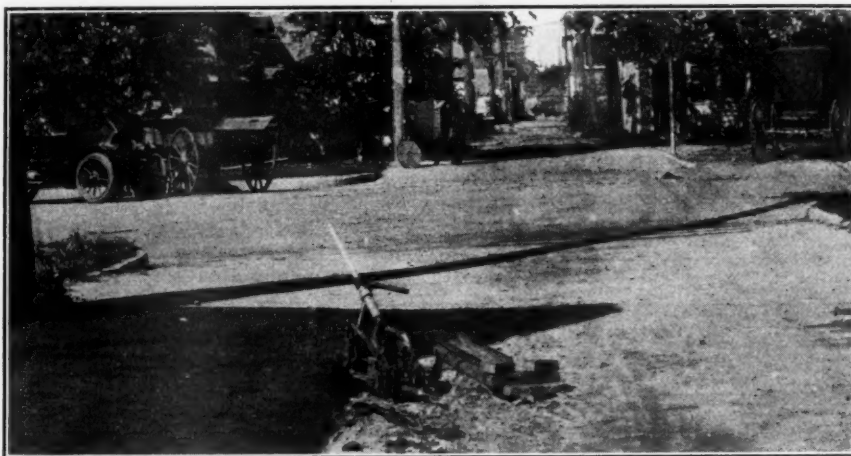
In installing sewer, water, gas, electric and telephone services and laying cable for street lighting and police and fire alarm circuits, the digging up of the street results in much labor and cost and is frequently responsible for badly repaired pavements and litigation. The constant tearing up of newly laid pavements for putting in utility connections has become proverbial. Much of this work has been accepted as a necessary evil. The Easy pipe pusher has been devised to eliminate a large proportion of the need of digging. It is claimed to be able to put in 30 to 150 feet of pipe, at almost any depth, in an hour. From 75 to 85 per cent of the digging is obviated.

The cog drive principle is used in this device for pushing power. The machine rolls on track, and there is no friction or lost power, and the outfit is claimed not to slip, wedge or bind. The leverage is double compounded, and the power is delivered all behind the pipe, so that it is claimed that one can exert enough to push four tons. Triple backstop pawls take up the backlash and spring of the pipe. The driving pawls are instantly reversible for pushing and pulling. The pipe is firmly gripped in vise jaws, and the machine rolls forward over the cog tracks, pushing the pipe along. The jaws are then released, and the machine rolled back for a new grip. The machine is made of malleable iron and steel and has hardened and tempered steel vise jaws.

A vital part of the pusher is the spe-

cial turned steel pilot for guiding the pipe in the right direction. It is made so that there is over fifteen times the resistance to its being pushed to one side as the point of it is likely to encounter. Small stones or roots will not deflect it. In ordinary work only

inches high, and weighs 100 pounds. It can be handled in two parts, the carriage weighing about 65 pounds, and the whole can easily be handled in any ditch by one man. It can push pipe up to 1½ inch and is suited to all ordinary work. It can be used in any



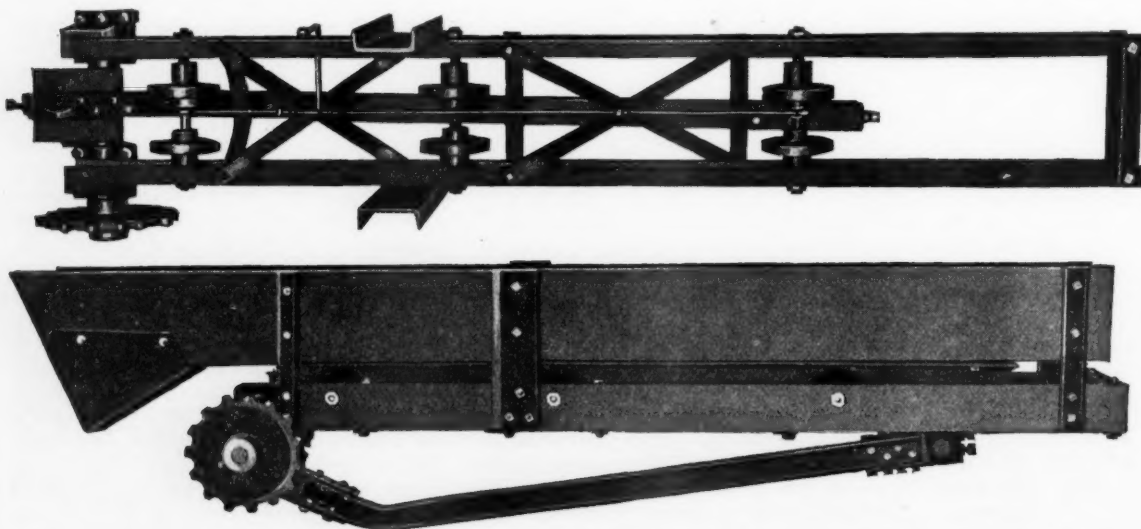
EASY PIPE PUSHER INSTALLING 4-INCH CONDUIT.

a short ditch is required in which to start the machine, and in work from a basement even this is unnecessary. Where the pipe is to be pushed long distances, a small hole about 18 by 36 inches must be dug every 50 to 75 feet for aligning purposes. All machines are equipped with a special sighting device to help align the pilot. The machine will work easily under pavements, sidewalks, floors, streets and lawns.

The outfit is built in two sizes. The standard machine for general use is 10 inches wide, 22 inches long and 12

soil which can be dug with a spade.

The special machine for heavy work is 19 inches wide and 22 inches long. The carriage weighs 200 pounds, and the total weight is 400 pounds. It is built to handle 1 to 4-inch pipe and will work in very hard soil. It has triple gears—all gears have shrouded teeth. It has two speeds—low for heavy work and high for ordinary work. The length of track is 60 inches. This machine can be used for conduits, water and gas mains. One of the accompanying illustrations shows the large-size pusher. The other shows an



UNDER-FRAME OF FEEDER.

SIDE VIEW OF FEEDER.

FRAME OF FEEDER OF SUNBURY AUTOMATIC CAR UNLOADER.



actual job. A wire conduit, 4 inches outside diameter, was pushed under a paved street intersection without disturbing the pavement. The machine was set in a ditch just outside the pavement. A 1¼-inch pipe was pushed

long. Feeders of different dimensions are made for handling bulky and coarse materials. The feeder is provided with wearing plates. The lower ones are securely bolted to the bottom of the reciprocating plate, while the vertical

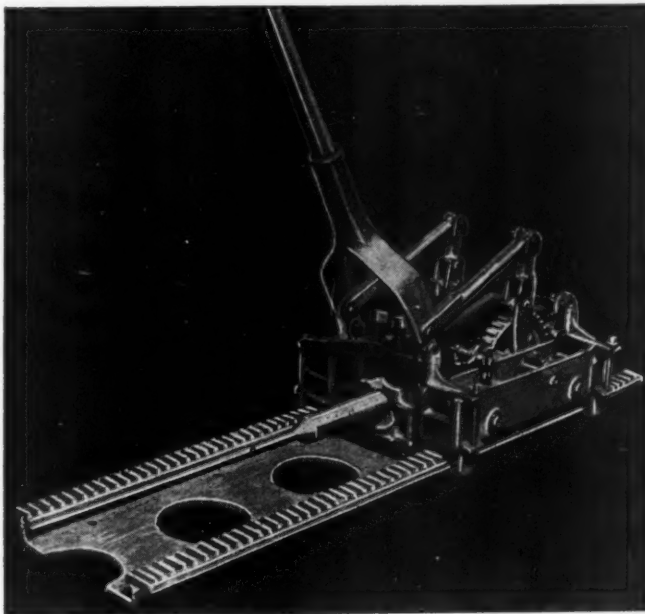
and through them to the bearings. All bearings are babbitted.

The machine is made in a number of sizes and styles. No. 1 is capable of handling from 30 to 50 tons per hour of crushed stone, sand, gravel, coal slag or other loose materials. The elevator is made entirely of structural steel, securely braced and will not sag. It is 30 feet long, extreme height above ground being 22 feet. The frame is made from 5-inch steel channels. The buckets are made of 14 gauge steel, 16 inches wide, 8 inches deep and 10¼ inches flight, riveted to heavy double detachable link chains.

The No. 5 machine is for smaller jobs. It is built to load a wagon in from two to four minutes. It has the same size feeder and engine as the No. 1 outfit, while the elevator is 20 feet long, with chute for unloading. The No. 8 machine has a 25-foot elevator. In loading, the unloader is reversed. The feeder is placed on a level with the top of the ground and bolted to timbers on sides. These timbers form the foundation for a four-yard hopper bottom bin, 7 feet long, 4 feet wide and 4 feet deep. This bin is placed directly over the feeder which forms the bottom. Attached to the upper end of the elevator is an eight-foot chute, which carries the material to the center of the car.

The No. 10 machine is mounted. It has the same size feeder and engine as the No. 1 machine; the elevator is 20 feet long and the extreme height is 14 feet above ground. A bin of one cubic yard capacity is attached to the upper end of the elevator frame, with a clearance of eight feet above the roadway. The truck has 24-inch front and 28-inch rear wheels equipped with

SPECIAL  
SIZE  
EASY  
PIPE  
PUSHER  
FOR  
HEAVY  
WORK.



under the pavement to the manhole across the street, 100 feet away. Increasing couplings were put on the pipe and all pulled back, enlarging the hole to the required size of the conduit. The total time to make the push, enlarge the hole and put in the conduit, which was set with compound, was less than one day, with two men working.

The outfit is made by the Easy Manufacturing Company, David City, Neb.

#### AUTOMATIC CAR LOADER.

##### "Sunbury" Automatic Loading and Unloading Machine.

The "Sunbury" car loading and unloading machine was devised especially for handling large quantities of material from railroads in a short time. The principle used is the construction of a stationary feeder underneath the rails, parallel with and between the ties, with a movable or reciprocity bottom.

The all steel feeder is placed between the tracks and bolted fast. In operation, the bottom is moved back and forth on oiled roller bearings with a movement of eleven inches at each revolution of the crank shaft. Each outward movement carries the material toward the elevator at the rate of fifty times a minute, depositing it in the elevator on the backward stroke. The machine is automatic and requires no attention except for oiling and starting. Power is provided by an 8 h. p. hopper cooled gasoline engine, of Olds horizontal construction, equipped ready for service. A small amount of excavation is necessary to accommodate the feeder and elevator.

The regular size of feeder is 12 inches wide, 10 inches deep and 10 feet

ones are adjustable, being held in place by bolts through slotted holes in sides and back of feeder. A few light taps with a hammer are sufficient to adjust the wear. The frame of the feeder is made entirely of structural steel. The three sets of rollers carry the reciprocating bottom. These rollers are mounted on hollow steel axles, which are kept full of lubricating oil. Oil is carried on the axles by a feed pipe

SUNBURY  
CAR UNLOADER  
No. 10 MOUNTED  
TYPE.



6x $\frac{1}{2}$ -inch tires. The outfit can be folded for easy transportation. It is built to load a wagon or truck in from one to three minutes.

The accompanying illustrations show two views of the feeder and a No. 10 machine. The equipment is made by the Sunbury Manufacturing Company, Sunbury, O.

## INDUSTRIAL NEWS

**Cast-Iron Pipe.**—Prices still remain at their high level of the last few weeks. The general inactivity in orders and construction continues. Quotations: Chicago, 4-inch Class B and heavier, \$68.50; 6-inch, \$65.50. New York, 4-inch, class B and heavier, \$68.50; 6-inch, \$65.50. Birmingham, 4-inch, Class B and heavier, \$63; 6-inch, \$60; class A, \$1 extra.

**The Ransome Concrete Machinery Company of New Jersey** has just been incorporated with a capital stock of \$1,000,000, \$500,000 cumulative preferred stock and \$500,000 common stock. The new corporation takes over the business and plants of the old Ransome Concrete Machinery Company, with works at Reading, Pa., and Dunellen, N. J., and executive offices in New York city. The company has been in business 25 years. Mr. Frank L. Brown succeeded Mr. E. L. Ransome, well-known as a pioneer in the field of concrete machinery three years ago, and under his able management the business has expanded so that the new incorporation became necessary. It is planned to further extend the business until it covers a complete line of building contractors' equipment, contractors' machinery and road builders' machinery and equipment. The line includes the widely-used and favorably-known Ransome Bantam mixers, the regular Ransome standard machines, spouting and other equipment, and the Ransome-Caniff pneumatic mixers and placers. The directors of the newly incorporated company are: Frank L. Brown,

New York, president; John J. Givens, Dunellen, N. J., treasurer; H. K. Brookes (vice-president, American Express Co.), New York; C. H. Haney (sales manager, International Harvester Corporation), Chicago; Robert H. Moody, New York, secretary; John G. Wood (general manager of works, International Harvester Co.), Chicago; G. F. Steele (manager News Print Association), New York.

**The Walter A. Zelnicker Supply Co.** St. Louis, Mo., has secured the services of Mr. J. C. Bryan, formerly with Manning, Maxwell & Moore, Inc., as southwestern representative of the Ashcroft Manufacturing Co., The Consolidated Safety Valve Co., The Hayden & Derby Manufacturing Co., and the Hancock Inspirator Co. Mr. Bryan will be associated with the equipment department of the Zelnicker Company.

**A. W. Ransome**, for many years closely identified with the development and manufacture of concrete machinery, has become connected with the **Blaw-Knox Co.**, Farmers' Bank Building, Pittsburgh. Mr. Ransome, for a long time, has been developing and putting into practice patents on improved concrete machinery, all of which have been purchased by the Blaw-Knox Co., and will be marketed and probably further developed under his direction as manager and chief engineer of the mixer department of the above named company.

**The Goodyear Tire & Rubber Company**, Akron, O., is announcing the appointment of managers in several of its branches as follows: Wade V. Aydelotte, formerly staff man for the motor truck tire department, has been made manager of the branch at Newark, N. J. A. W. Ellis has been transferred from Louisville, Ky., to Long Island City, N. Y., as assistant branch manager. H. F. McClure, formerly general line salesman at Louisville, succeeds Mr. Ellis as branch manager there. H. T. Rose-

land, formerly manager of the Phoenix, Arizona, branch, has been appointed manager of the branch at El Paso, Tex., succeeding T. J. Fitzgerald, who has been called into the federal service. D. W. Sanford, general line salesman at Phoenix, becomes acting branch manager there.

### NEW YORK CITY CIVIL SERVICE.

Consultant on City Planning.  
September 24, 1917.

Applications will be received by the Municipal Civil Service Commission, Municipal Building, Manhattan, New York City, until September 24, 1917, for the position of consultant on city planning. No applications delivered at the office of the Commission, by mail or otherwise, after 4 p. m., Monday, September 24, 1917, will be accepted. Application blanks will be mailed upon request provided a self-addressed stamped envelope or sufficient postage is enclosed to cover the mailing.

The requirement that applicants must be residents of the State of New York is waived for this examination. Competitive examination to be open to all citizens of the United States. Persons who accept appointment must thereafter reside in the State of New York.

The requirement that every application shall bear the certificates of four reputable citizens whose residences or places of business are within the City of New York is waived for applicants for this examination whose previous occupation or employment has been wholly or in part outside the City of New York, and the said certificates will be accepted from persons resident or engaged in business elsewhere. The subjects and weights of the examination are: Experience, 7; 70% required. Oral, 3; 70% required. A qualifying physical examination will be given. Applications for this examination must be filed on a special blank, Form D, with insert.

**Duties.**—The duties of the incumbent of this position are to investigate and report upon applications for modification of the Building Zone Resolution of the Board of Estimate and Apportionment, and to develop comprehensive plans for the improvement of street traffic conditions.

**Requirements.**—Candidates must present evidence of at least three years of experience in charge of the planning and directing of investigations of street traffic conditions, or other similar experience tending to qualify for the performance of the duties of this position.

Candidates must be at least 25 years of age on or before the closing date for the receipt of applications.

The compensation rate proposed by the Board of Estimate and Apportionment for this position is \$4,140 per annum.

There is one vacancy in the office of the Committee on City Plan of the Board of Estimate and Apportionment.

## MUNICIPAL INDEX

(Continued from page 802.)

work. 2 ill. 1,200 words. Engineering News-Record, August 30. 15 cts.

Small Circular Concrete Bins Used for Storage of Cement. Designed for hydrostatic pressure of 25 pounds per sq. ft. 3 ill. 1,200 words. Engineering News-Record, August 30. 15 cts.

Army Cantonment at Louisville Laid Out Like Suburban Development. Water obtained from Louisville system. Planting roads, sewers, water-works and camp lay-out. 4 ill. 1,500 words. Engineering News-Record, August 30. 15 cts.

Explosives for Loosening Soil. Methods and kinds of explosives. 800 words. Municipal Journal, August 2. 10 cts.

River Channel Improvement at Columbus. Work planned to prevent recurrence of damage done by flood of 1909. General plan of work. 1 ill. 1,750 words. Municipal Journal, August 16. 10 cts.

The Distribution of Pressures Through Earth Fills. Abstract of paper by A. T. Goldbeck. 2 ill. 2,250 words. Good Roads, August 18. 10 cts.

Engineering Team-Work Aids Rush Army Job at Camp Upton, N. Y. By R. K. Tomlin, Jr. 18 ill. 5,000 words. Engineering News-Record, August 23. 15 cts.

County Plant Produces Gravel at Cost of 17.4 Cents Per Cubic Yd. Experience

in Logan County, Ill. 1 ill. 800 words. Engineering and Contracting, August 1. 10 cts.

Flat Site at Chillicothe Camp Demands Careful Drainage. Area of 1,900 acres has extreme range of elevation of 25 feet, but is underlain by gravel bed. Steam shovel used to dig well for water supply. By N. C. Rockwood. 6 ill. 2,000 words. Engineering News-Record, August 16. 15 cts.

Methods and Costs in Driving the Pine Mountain Tunnel. 1,500 words. Engineering and Contracting, August 15. 10 cts.

Municipal Public Markets. Wholesale, retail and farmers' market. Advantages and disadvantages of each and extent of use. Site and construction. 1,600 words. Municipal Journal, August 30. 10 cts.

Bidding Prices on Public Work During the Last Three Months. 6 pages. Engineering and Contracting, August 29. 10 cts.

Column Tests and Formulas. By R. S. Foulds. 1,800 words. Engineering News-Record, August 9. 15 cts.

How Temperature Varied in Two Dams While Cement Was Setting. Thermometer readings in large structure showed an increase of 44 degrees F. 14 days after pouring. Thin arch showed slight increase, affected by the weather. By R. A. Monroe. 3 ill. 1,750 words. Engineering News-Record, August 9. 15 cts.

Fire and Load Tests of Columns Now Being Made. National Board of Fire Underwriters test building columns under combined fire and load conditions. 1 ill. 1,600 words. Engineering News-Record, August 2. 15 cts.

The Choice of Grasses to Protect Road Embankments from Erosion. By W. C. Buetow. 1,000 words. Engineering News-Record, August 2. 15 cts.

Effect of Controllable Variable on Toughness Test for Rock. 3,500 words. Engineering and Contracting, August 1. 10 cts.

Form Carpentry Sublimated. 500 words. The Contractor, August 3. 10 cts.

Methods of Handling and Measuring Bulk Cement. 1,200 words. Engineering and Contracting, August 1. 10 cts.

Apparent Specific Gravity of Non-Homogeneous Fine Aggregates. From a paper by A. S. Rea. 1,250 words. Good Roads, August 25. 10 cts.

Effect of Sand Grading on Strength of Concrete. 1,000 words. Engineering and Contracting, August 22. 10 cts.

Method and Cost of Repointing Sea Wall with Cement Gun. 2,000 words. Engineering and Contracting, August 15. 10 cts.

Effect of Shape of Cutting Edge on Cutting Speed and Wearing Qualities of Drill Bits. 3,500 words. Engineering and Contracting, August 15. 10 cts.